



Bharatiya Vidya
Bhavan

BHAVAN'S VIVEKANANDA COLLEGE

OF SCIENCE, HUMANITIES AND COMMERCE

SAINIKPURI, SECUNDERABAD

Affiliated to Osmania University-Autonomous College

Reaccredited with 'A' grade by NAAC

B.Sc. MATHEMATICS I YEAR

Programme Name - B Sc (MECs, MPCs, MSCs)

SEMESTER-III

(75Hrs)

(w.e.f 2026-27 for students joined in 2025-26)

Course Name: Differential and Vector Calculus

Course Code: MT321

HPW: 5L+ 1T

Credits: 5

Course Objectives: The objectives of the course are

1. Understand and analyze functions of two variables, limits, continuity, and partial derivatives, including geometric interpretation and homogeneous functions.
2. Apply total differentials, composite and implicit differentiation, Taylor's theorem, and Lagrange's method to solve optimization and approximation problems.
3. Evaluate line, surface, and volume integrals, including double integrals using Fubini's theorem and coordinate transformations.
4. Analyze vector fields using gradient, divergence, and curl, and apply Gauss Divergence and Stokes' theorems in physical and geometrical contexts.

Unit- I (20HRS)

Partial Differentiation: Introduction, Functions of two variables, Neighborhood of a point (a, b), Continuity of a function of Two Variables, Continuity at a point, Limit of a function of two variables, Partial derivatives, Geometrical representation of a function of two Variables, Homogeneous functions.

(Book 1: 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8)

Unit- II: (15 HRS)

Theorem on Total Differentials, Composite Functions, Differentiation of Composite functions, Implicit Functions, Taylor's theorem for a function of two variables, Lagrange's method of undetermined multipliers.

(Book 1: 11.9, 11.11, 9.7)

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Unit-III: (20HRS)

Line Integrals, Surface integrals, Volume integrals: Line Integrals, Double Integrals, Surface Integrals, Volume Integrals.

(Book 2: Sec. 2.2, 2.3, 2.4) (Book 3: Sec.13.1: Double Integrals over Rectangles, Theorem 1 Fubini's theorem (First Form), Theorem 2 Fubini's theorem (stronger Form), Finding the Limits of Integration, only worked out examples)

Unit-IV: (20HRS)

Gradient, Divergence and Curl : Gradient of scalar field, Divergence of vector field, Curl of a vector field.

Integral theorems: Divergence theorem-Stokes theorem.

(Book 2 :Sec. 3.2, 3.3, 3.4, 5.1, 5.2)

Prescribed Text Book:

1. Differential Calculus, Shanti Narayan, P.K. Mittal, S. CHAND & company pvt. Ltd., Fifteenth Edition
2. Vector Calculus, P.C. Matthews, Springer-Verlag London Ltd. 1998, Seventh Edition.
3. Calculus and Analytic Geometry, G.B. Thomas & R.L. Finney, Addison-Wesley publishing company, Ninth Edition.

References:

1. William A. Granville, Percy F. Smith & William R. Longley – Elements of the Differential and Integral Calculus, Ginn & Co., 1941.
2. G.B. Thomas & R.L. Finney – Calculus, Addison-Wesley
3. Joseph Edwards-Differential Calculus for Beginners, Macmillan, London, 1893.
4. R.T. Smith & R. Minton-Calculus, McGraw-Hill Education, 4th Edition, 2012.
5. Eli S. Pine-How to Enjoy Calculus, Steinlitz-Hammacher Company, 5th Edition, 1984.

Course Outcomes

MT321 CO1: Compute and interpret partial derivatives and continuity of functions of two variables.

MT321 CO2: Apply Taylor's theorem and Lagrange multipliers to solve optimization problems.

MT321 CO3: Evaluate double and line integrals using appropriate methods and coordinate systems.

MT321 CO4: Apply divergence and Stokes' theorems to analyze vector fields.


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CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MT321 CO1	3	2	1	1	2	1	1	1	1	2
MT321 CO2	3	3	1	2	2	1	1	2	1	2
MT321 CO3	3	3	1	2	2	1	2	2	1	2
MT321 CO4	3	3	2	2	2	1	2	2	2	2

1/5/22
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B.Sc. MATHEMATICS II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
Skill Enhancement Course-I
SEMESTER-III
(30Hrs)

(w.e.f 2026-27 for the students admitted from the year 2025-2026)

Course Name: Theory of Equations
Course Code: SE321

HPW:2L
Credits: 2

Course Objectives: The objectives of the course are

1. To introduce the fundamental properties of algebraic equations, including the nature and behavior of real and imaginary roots.
2. To develop understanding of the relationships between roots and coefficients, and to apply these concepts in solving and transforming equations.

UNIT I (15 Hrs)

Theorems relating to the real roots of equations, Existence of a root in the general equation- Imaginary roots, Theorem determining the number of roots of an equation, Equal roots, Imaginary roots enter the equation in pairs, Descartes' rule of signs for positive roots, Descartes' rule of signs for negative roots.

UNIT II (15 Hrs)

Relations between the roots and coefficients, Application of the Theorem, Depression of an equation when a relation exists between two of its roots, The cube roots of unity, Symmetric Functions of the roots

Prescribed Book:

"*The Theory of Equations*", W.S Burnside and A.W. Panton, Ponsonby & Gibbs,
University Press, Dublin. 8th Edition.
UNIT1- Chapter:2[12 to 20]
UNIT2- Chapter:3[23 to 27]

Reference Books:

1. C.C. Mac Duffee, *Theory of Equations*
2. Hall and Knight, *Higher Algebra*

Course Outcomes:

SE321 CO1: Analyze the nature of roots of algebraic equations using theorems such as Descartes' rule of signs and identify real and imaginary roots.

SE321 CO2: Apply the relations between roots and coefficients to solve equations, evaluate symmetric functions, and transform equations when conditions on roots are given.


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B.Sc. MATHEMATICS II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
Skill Enhancement Course-II
SEMESTER-III
(30Hrs)

(w.e.f 2026-27 for the students admitted from the year 2025-2026)

Course Name: Logic and Sets

HPW:2L

Course Code: SE321A

Credits: 2

Course Objectives: The objectives of the course are

1. To introduce the fundamental concepts of mathematical logic, including connectives, truth tables, logical equivalence, implications, and quantifiers.
2. To develop understanding of set theory, counting principles, and basic probability concepts including conditional probability and independence.

UNIT I (15 Hrs)

Basic connectives and truth tables, Logical equivalence: Laws of logic, Logical Implication: Rules of inference, The use of quantifiers, Quantifiers, Definitions and proofs of theorems.

UNIT II (15 Hrs)

Sets and subsets, set operations and the laws of set theory, Counting and Venn diagrams, The axioms of probability, Conditional probability: independence.

Prescribed Books:

1. "Discrete and Combinatorial Mathematics", Ralph P Grimaldi, Pearson, 5th edition
Unit-I: Chapter2[2.1, 2.2, 2.3, 2.4, 2.5]
Unit-II:Chapter3[3.1, 3.2, 3.3, 3.5, 3.6]
2. "Discrete mathematics for computer scientists and Mathematicians", Joe L .Mott, Abraham Kendel, Prentice Hall of India.

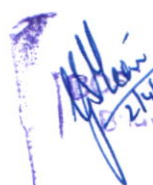
Reference Books:

1. Seymour Lipschutz, Marc Lars Lipson, Discrete Mathematics, Tata McGraw-Hill.
2. Kenneth H. Rosen: Discrete Mathematics, Mc Graw Hill Editions.

Course Outcomes:

SE321A CO1:Apply logical reasoning, laws of logic, and rules of inference to construct valid mathematical arguments and proofs.

SE321A CO2:Analyze and solve problems involving sets, counting techniques, Venn diagrams, and probability, including conditional probability and independence.


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B.Sc. MATHEMATICS II YEAR

Programme Name - B Sc (MECs, MPCs, MSCs)

SEMESTER-IV

(75Hrs)

(w.e.f 2026-27 for the students admitted from the year 25-26)

Course Name: Algebra

Course Code: MT421

HPW: 5L + 1T

Credits: 5

Course Objectives:

This course is aimed at familiarizing students with concepts in Abstract Algebra

1. To recall definitions and basic properties of algebraic structures such as groups, subgroups, permutation groups, and their properties.
2. To apply and analyze subgroup criteria, solve problems related to group operations, normal subgroups and construct quotient groups, homomorphisms and isomorphisms in groups.
3. To apply, analyze and use rings to solve problems and explain different classes of rings and their structural properties.
4. To examine and ideals and quotient rings and their algebraic significance, evaluate and construct polynomial rings and apply Euclidean ring concepts in advanced problem-solving.

UNIT-I GROUPS-I (20Hrs)

Definition of a Group, Some Examples (2.2.1 to 2.2.5), Some Preliminary Lemmas, Problems (3,4,5,7,13,14,17,20,23,24,25,26,27,28,29), Subgroups, Examples (2.4.3 to 2.4.10), (Corollary 1 to 5 as note), Problems (1,2,3,4,5,8,9,21,33,34,35,36,37,38,39,40).

UNIT-II GROUPS-II (20Hrs)

Normal Subgroups, Lemmas (2.6.1 to 2.6.3), Quotient Group theorem, Problems (1,4,6,11), Homomorphisms, Some Examples, Lemma (2.7.1 to 2.7.3), Problems (1,4,11), Cayley's Theorem (no problems), Permutation Groups problems only (1 to 9).

UNIT- III RINGS I (20Hrs)

Definition of Ring Theory and Examples of Rings (3.1.1 to 3.1.7), Some Special Classes of Rings, Problems (1,4,5,7,8,14,15), Homomorphisms Definition, Example (3.3.1 to 3.3.4).

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21/4/26

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UNIT- IV RINGS II (15Hrs)

Ideals and Quotient Rings, Problems (1,2,8,13,14,16,18) More Ideals and Quotient Rings, Euclidean Rings (Lemma no proofs), Polynomial Rings.

Prescribed Text Book:

Topics in Algebra, Herstein I.N., John Wiley & Sons, Second Edition, 1975.

Unit-1: Chapter: 2 [2.1, 2.2, 2.3, 2.4]

Unit -II: Chapter: 2 [2.6, 2.7, 2.9, 2.10]

Unit -III: Chapter: 3 [3.1, 3.2, 3.3]

Unit IV: Chapter: 3 [3.4, 3.5, 3.7, 3.9]

Reference Books:

1. Basic Abstract Algebra, P.B. Bhattacharya, S.K. Jain & S.R. Nagpaul Cambridge University Press (Indian Edition also by Hindustan BAgency), Second Edition, 1994.
2. A First Course in Abstract Algebra, J.B. Fraleigh, Addison-Wesley, Seventh Edition, 2003.
3. Contemporary Abstract Algebra, Joseph A Gallian, Cengage Learning, Ninth Edition, 2017.

Course Outcomes:

After completion of the course students will be able to

MT421 CO1: Define groups, rings, and related algebraic structures with examples and Explain subgroup properties and permutation group concepts clearly.

MT421 CO2: Apply subgroup concepts and perform computations in group theory problems, analyze normal subgroups and construct quotient groups with proper reasoning, solve problems using homomorphisms and isomorphisms in algebraic structures.

MT421 CO3: Analyze various types of rings and their properties.

MT421 CO4: Evaluate ideals and construct quotient rings with justification, formulate and solve problems involving polynomial rings and Euclidean rings.


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CO-PO Mapping:

Course Outcomes \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
MT421 CO1	3	2	1	1	1	1	1	1	1	1
MT421 CO2	3	3	1	3	2	1	1	1	1	2
MT421 CO3	3	2	1	1	1	1	1	1	1	1
MT421 CO4	3	3	1	2	1	1	1	2	1	2
Mean/Average	3	2.5	1	1.7	1.2	1	1	1.2	1	1.5



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B.Sc. MATHEMATICS II YEAR

Programme Name - B Sc (MECs, MPCs, MSCs)

Skill Enhancement Course-III

SEMESTER-IV

(30Hrs)

(w.e.f 2026-27 for the students admitted from the year 2025-2026)

Course Name: Number Theory

HPW : 2L

Course Code: SE421

Credits: 2

Course Objectives: The objectives of the course are

1. To introduce fundamental concepts of number theory, including congruences, number theoretic functions, and properties of integers.
2. To develop understanding of important theorems such as Euler's theorem and Fermat's theorem, and their applications in number theory.

Unit- I (15Hrs)

The Goldbach conjecture, Basic properties of congruences, Binary and Decimal Representation of integers, Number Theoretic Functions, The Sum and Number of divisors, The Mobius Inversion Formula, The Greatest integer function.

Unit- II (15Hrs)

Euler's generalization of Fermat's Theorem, Euler's Phi function, Euler's theorem, Some Properties of the Euler's Phi function.

Prescribed Books:

- "Elementary Number Theory" David M Burton, 7th Edition
Unit I 3.5, 4.2, 4.3, 6.1, 6.2, 6.3
Unit II 7.2, 7.3, 7.4

References Books:

- Thomas Koshy, *Elementary Number Theory and its Applications*
- Kenneth H Rosen, *Elementary Number Theory*

Course Outcomes:

SE421 CO1: Analyze properties of integers using congruences, divisor functions, Mobius inversion formula, and representations of numbers.

SE421 CO2: Apply Euler's Phi function and related theorems to solve problems involving modular arithmetic and number theoretic computations.

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B.Sc. MATHEMATICS II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
Skill Enhancement Course-IV
SEMESTER-IV
(30Hrs)

(w.e.f 2026-27 for the students admitted from the year 2025-2026)

Course Name: VERBAL REASONING

HPW: 2 Lecture

Course Code: SE421A

Credits: 2

Course Objectives: The objectives of the course are

1. To develop analytical and logical reasoning skills through number series, patterns, Venn diagrams, and mathematical operations.
2. To enhance problem-solving ability in arithmetical reasoning, including age problems, data-based problems, and cause-effect relationships.

UNIT-1 (15 Hrs):

Numbers And Diagrams:

Series Completion: Number Series, Alphabet Series.

Series Completion: Alpha Numeric Series, Continuous Pattern Series.

Logical Venn Diagrams.

Mathematical Operation: Problem Solving by Substitution, Interchange of Signs and Numbers.

[Text Book: Sec. I: 1,9,13(type 1 and 2)]

UNIT-II (15 Hrs):

Arithmetical Reasoning:

Mathematical Operations: Deriving the Appropriate Conclusions.

Arithmetical Reasoning: Calculation Based Problems, Data Base Problems.

Arithmetical Reasoning: Problems on Ages, Venn Diagram-Based Problems.

Cause and Effect Reasoning.[Text Book: Sec. I: 13(type 3),15]

TEXT BOOK: A Modern Approach to Verbal and Non-Verbal Reasoning by Dr. R. S. Aggarwal.

Course Outcomes:

SE421ACO1: Analyze and solve problems involving number series, alphabet series, patterns, and logical Venn diagrams using appropriate reasoning techniques.

SE421ACO2: Apply arithmetical and logical reasoning skills to solve real-life problems involving data interpretation, age calculations, and cause-effect analysis.

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