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 II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
SEMESTER-III(75Hrs)
(w.e.f 2024-25 for the students admitted from the year 23-24)

Course Name: Real Analysis **HPW: 5L + 1T**

Course Code: MT321 **Credits: 5**

Course Objectives: This course is aimed at familiarising students with concepts of Real Analysis.

COb1: To learn basic properties of Sequences of Real numbers and their limits.

COb2: To acquire knowledge about Series, Continuity and Limits of Real functions.

COb3: To explain the concepts of Derivatives of a Real function.

COb4: To analyse concepts of Riemann Integration.

Unit- I Sequence (17Hrs)

Sequences: Limits of Sequences, A Discussion about Proofs, Limit Theorems for Sequences, Monotone Sequences and Cauchy Sequences; Subsequences, Lim sup's and Lim inf's(Only definition)

Unit- II Series and Continuity (23Hrs)

Series: Alternating Series and Integral Tests.

Continuity: Continuous Functions, Properties of Continuous Functions, Uniform Continuity, Limits of Functions.

Unit- III Differentiation (20Hrs)

Differentiation: Basic Properties of the Derivative, The Mean Value Theorem, L'Hospital Rule, Taylor's Theorem.

Unit- IV Integration (15Hrs)

Integration: The Riemann Integral, Properties of Riemann Integral(Theorems without proof), Fundamental Theorem of Calculus.

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

Prescribed Text Book:

Elementary Analysis –The Theory of Calculus, Kenneth A Ross, 2nd Edition, Springer Publishers.

Unit 1-Chapters: 2--7,8,9(no proofs: 9.2 to 9.10); 10.1 to 10.11(no proofs 10.4 to 10.7); 11.1 to 11.6(no proofs: 11.2); 12(no proofs)]

Unit 2- Chapters: 2--14,15

Chapters: 3 --17.1to 17.5(no proofs); 18.1 to 18.6(no proofs 18.1,18.3,&18.6); 19.1 to 19.5; 20.1 to 20.10(no proofs)]

Unit 3- Chapters:5---28.1,28.2; 29.1 to 29.8(no proofs-29.4 to 29.8); 30.1, 30.2(no proof); 31.1 to 31.6(no proofs 31.4 to 31.6)

Unit 4- Chapters:6--32.1 to 32.9(no proof :32.2 to 32.4, 32.7); 33.1,33.2,33.5,33.7, 34.1

Reference Text Book:

1. Introduction to Real Analysis by Robert G. Bartle& Donald R. Sherbert, John Wiley & Sons, Inc.(Third Edition)
2. A course of Real Analysis by Shanti Narayanan & PK Mittal.
3. William .F. Trench , Introduction to Real Analysis.
4. Lee Larson, Introduction Real Analysis.

Course Outcomes:

After completion of course students will be able to:

MT321 CO1: Interpret properties of Sequences of Real numbers.

MT321 CO2: Interpret the convergence and divergence of the series and also Analyse Continuity ,Uniform continuity of Real functions and evaluate their Limits.

MT321 CO3: Interpret the concept of Derivability of Real Functions.

MT321 CO4: Summarise and synthesise the concepts of Riemann Integration.

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

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 II YEAR

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

Skill Enhancement Course-I

SEMESTER-III

(30Hrs)

(w.e.f. 2021-22 for the students admitted from the year 20-21)

Course Name: Theory of Equations **HPW:2L**

Course Code: SE321 **Credits: 2**

Course Objective: To familiarize the concept of Polynomial equation and its roots.

COb1: To learn the concepts of finding the roots of the polynomial equations and Descarte's rule of signs in finding the number of positive and negative roots of a polynomial equation.

COb2: To acquire knowledge about the relation between roots and coefficients of a polynomial equation and find Symmetric functions of the root.

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,

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

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:

At the end of the course Students will be able to:

SE321 CO1: Compute the roots of the polynomial equations.

SE321 CO2: Interpret the relation between roots and coefficients of a polynomial equation and evaluate Symmetric functions of the root.

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

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 II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
Skill Enhancement Course-II
SEMESTER-III
(30Hrs)
(w.e.f. 2021-22 for the students admitted from the year 20-21)

Course Name: Logic and Sets **HPW:2L**
Course Code: SE321A **Credits: 2**

Course Objective: To familiarize the concept of Logic and Sets theory.

COb1: To learn the concepts in logic, Determine the truth value of a statement.

COb2: To acquire knowledge about the basic concepts of set theory and probability.

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.

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda C
Si

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

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: At the end of the course Students will be able to:

SE321A CO1: Compute logical reasoning to solve a variety of problems.

SE321A CO2: Evaluate the operations on sets, represent sets in Venn diagrams and compute problems in Probability.

2/4/25

CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

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 II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
SEMESTER-IV
(75Hrs)
(w.e.f 2021-22 for the students admitted from the year 20-21)

Course Name: Algebra HPW: 5L + 1T
Course Code: MT421 Credits: 5

Course Objectives:

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

COb1: To learn basic algebraic structures like groups.

COb2: To acquire knowledge about Permutation Groups and Factor groups.

COb3: To explain the concepts of Homomorphisms, Isomorphism and Rings.

COb4: To analyse various concepts of Rings and Fields.

UNIT-I GROUPS-I (20Hrs)

Groups: Definition and examples of groups, Elementary properties of groups. Finite groups and Subgroups: Terminology and notation, Subgroup tests, Examples of subgroups. Cyclic Groups: Properties of cyclic groups, Classification of subgroups of cyclic groups.

UNIT-II GROUPS-II (20Hrs)

Permutation Groups: Definition and notation, Cycle notation, Properties of Permutations, A check digit scheme based on D5. Cosets and Lagrange's theorem: Properties of cosets, Lagrange's theorem and consequences, An application of cosets to permutation groups, The rotation group of a cube and a soccer ball. Normal subgroups and Factor groups: Normal subgroups, Factor groups, Applications of factor groups.

UNIT- III: GROUPS III & RINGS I (20Hrs)

Group Homomorphisms: Definition and examples, Properties of homomorphisms, Isomorphisms: Definition and examples, Cayley's theorem, Properties of Isomorphisms, The first isomorphism theorem, Automorphisms. Introduction to Rings: Motivation and definition, Examples of rings, Properties of rings, Subrings.

2/4/25
CHAIRPERSON
BOS In Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

UNIT- IV: RINGS II (15Hrs)

Integral Domains: Definition and examples, Fields, Characteristics of a ring.
Ideals and factor rings: Ideals, Factor rings, Prime ideals and Maximal ideals.
Ring homomorphisms: Definition and examples, Properties of ring homomorphisms.

Prescribed Text Book:

"Contemporary Abstract Algebra", Joseph A Gallian, Cengage learning publishers, 9th edition.

Unit 1-Chapters: 2, 3 & 4 (No proofs: 4.1, 4.2, 4.4)
Unit 2-Chapters: 5, (No proofs:5.3,5.5,5.7) ; 7(No proofs: Corollary 5, 7.2 to 7.5) & 9 (No proofs: 9.3 to 9.7)
Unit 3-Chapters: 10(No proofs:10.2, 10.4); 6(No proofs: 6.2 to 6.5) & 12
Unit 4-Chapters: 13,14(No proofs:14.2)
&15 (No proofs:15.1, 15.4, 15.5,15.6 Corollary- 1,2,3)

Reference Books:

1. B.S.c Second Year Mathematics, Algebra, SEM IV Telugu Academy, Edition2021.
2. A First Course in Abstract Algebra, Fraleigh J.B, Pearson publications,7th Edition.
3. Topics in Algebra, Herstein, I.N, Wiley India Pvt. Limited, 2nd Edition.
4. Basic Abstract Algebra, Robert B. Ash, Dover Publications, 1st Edition.
5. Finite Group Theory, I Martin Isaacs, American Mathematical Soc., 1st Edition.
6. Advanced Modern Algebra, Joseph J Rotman, American Mathematical Soc,2nd Edition.
7. Basic Abstract Algebra, Bhattacharya, P.B Jain, S.K; and Nagpaul, S.R, Cambridge University Press, 2nd Edition.

Course Outcomes:

After completion of the course students will be able to

MT421 CO1: Interpret properties of basic Algebraic structures.

MT421 CO2: Compute and calculate permutations and factor groups

MT421 CO3: Evaluate Homomorphisms, Isomorphism and Rings.

MT421 CO4: Summarise and synthesise the concepts in Ring Theory

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

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 II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
Skill Enhancement Course-III
SEMESTER-IV
(30Hrs)
(w.e.f. 2021-22 for the students admitted from the year 20-21)

Course Name: Number Theory **HPW :2L**
Course Code: SE421 **Credits: 2**

Course Objective: The course is aimed at familiarising students with the properties of number theory and their uses.

COb1. To learn concepts related to properties of congruences.

COb2. To acquire knowledge about Fermat's Theorem, Euler's Phi function.

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: At the end of the course Students will be able to:

SE421 CO1: Summarise about properties of Number Theoretic Functions.

SE421 CO2: Interpret the results of Fermat's Theorem, Euler's Phi function

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.

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 II YEAR
Programme Name - B Sc (MECs, MPCs, MSCs)
Skill Enhancement Course-IV
SEMESTER-IV
(30Hrs)
(w.e.f. 2021-22 for the students admitted from the year 20-21)

Course Name: Vector calculus **HPW :2L**
Course Code: SE421A **Credits: 2**

Course objectives: To familiarize the concepts like Gradient, Divergence, Curl and their physical relevance.

COb1: To learn Line integral and surface integral concepts.

COb2: To acquire knowledge about Volume Integral, Gradient, Divergence and Curl.

Unit- I (15Hrs):

Line Integrals: Introductory Example, Work done against a Force, Evaluation of Line Integrals Conservative Vector Fields.

Surface Integrals: Introductory Example, Flow Through a Pipe Evaluation of Surface Integrals.

Unit- II (15Hrs):

Volume Integrals: Evaluation of Volume Integrals

Gradient,Divergence and Curl: Partial differentiation and Taylor series, Partial differentiation, Taylor series in more than one variable, Gradient of a scalar field, Gradients, conservative fields and potentials, Physical applications of the gradient.

Prescribed Books:

- Vector Calculus,P.C. Matthews,Springer publications.
  Unit 1-Chapter :2[2.2.1, 2.2.2, 2.2.3, 2.3.1 & 2.3.2]
  Unit 2-Chapter: 2[2.4.2]; 3[3.1& 3.2]

References Books:

- Calculus,G.B. Thomas and R.L. Finney, Pearson publications.
- Calculus, Anton, I. Bivens and S. Davis,John Wiley & Sons Inc
- Calculus, Smith and Minton, McGraw Hill.

Course Outcomes: At the end of the course Students will be able to:

SE421A CO1: To evaluateLine integral and surface integral.

SE421A CO2: To compute Volume Integral, Gradient, Divergence and Curl.

2/4/25
CHAIRPERSON
BOS in Mathematics and Statistics
Bhavan's Vivekananda College
Sainikpuri

Dr. N. KISHAN
M.Sc., Ph.D
Senior Professor of Mathematics
Department of Mathematics
Osmania University, Hyderabad-7.