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-I
(75Hrs)
(w.e.f 2025-26)

Course Name: Differential Equations **HPW: 5L + 1T**
Course Code: MT121 **Credits: 5**

Course Objectives: This course is aimed at familiarising students with differential equations.

COb1: To identify and learn the first-order ODEs, methods of integrating factors and linear differential equations.

COb2: To acquire knowledge of solving Differential Equations first order but not of first degree.

COb3: To find the general solution of Higher order linear differential equations with constant coefficients.

COb4: To find the general solution of Higher order linear differential equations with nonconstant coefficients and Partial differential equations.

Unit- I Differential Equations of First Order and First Degree (20Hrs)

Introduction, Equations in which Variables are Separable, Homogeneous Differential Equations, Differential Equations Reducible to Homogeneous Form, Linear Differential Equations, Differential Equations Reducible to Linear Form, Exact differential equations, Integrating Factors, Change in variables

Unit- II Differential Equations First Order but not of First Degree (17Hrs)

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. Applications of First Order Differential Equations: Growth and Decay, Dynamics of Tumour Growth, Radioactivity and Carbon Dating, Compound Interest, Orthogonal Trajectories.

Unit- III Higher order Linear Differential Equation-I (18Hrs)

Solution of homogeneous linear differential equations with constant coefficients, Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}$, bsinax,bcosax, x^k, xv, ve^{ax}, Method of undetermined coefficients.

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, Hyd-07.

Unit- IV Higher order Linear Differential Equation-II , Total and Simultaneous Differential Equations (20Hrs)

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

Total Differential Equations, Simultaneous Total Differential Equations, Equations of the form dx /P = dy / Q = dz /R.

Prescribed Text Book:

"Differential Equations and Their Applications", Zafar Ahsan, Prentice Hall of India Learning Pvt .Ltd, 2nd Edition, 2016.

Unit 1- Chapters:2[2.1 to 2.9]
Unit 2-Chapters:3[3.1&3.2]; 4[4.1 to 4.4 & 4.20]
Unit 3- Chapters:5[5.1 to 5.4]
Unit 4- Chapters:5[5.5 to 5.9]; 2[2.10 to 2.12]

Reference Books:

1. Frank Ayres Jr, Theory and Problems of Differential Equations.
2. Ford, L.R ; Differential Equations.
3. Daniel Murray, Differential Equations.
4. S. Bala Chandra Rao, Differential Equations with Applications and Programs.
5. Stuart P Hastings, J Bryce McLead; Classical Methods in Ordinary Differential Equations.

Course Outcomes:

Students will be able to:

MT121 CO1: Solve Differential equations of first order and first degree.

MT121 CO2: Calculate solutions of Differential Equations of first order but not of first degree and interpret applications of Differential Equations of first order & first degree.

MT121 CO3: Evaluate general solution of Higher order linear differential equations with constant coefficients.

MT121 CO4: Evaluate general solution of Higher order linear differential equations with nonconstant coefficients.

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Programme Name - B Sc (MECs, MPCs, MSCs)
SEMESTER-II (75Hrs)
(w.e.f 2025-26)

Course Name: Real Analysis **HPW: 5L + 1T**
Course Code: MT 221 **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

Real Numbers: Field Structure and Order Structure, Bounded and Unbounded Sets, Completeness in the set of Real Numbers, Absolute Value of a Real Number.

Open sets, Closed Sets and Countable Sets: Limit points of a set, Closed Sets, Countable and Uncountable Sets

Real Sequences: Sequences: Limit points of a sequence, Convergent Sequences, Non-Convergent Sequences(Definitions), Cauchy's General Principle of Convergence, Algebra of Sequences, Some important Theorems, Monotone Sequences

Unit- II

Infinite Series: Introduction, Positive Term Series, Comparison Tests for Positive Term Series, Cauchy's Root Test, D'Alembert's Ratio Test, Integral Test, Alternating Series (Leibnitz Test)

Functions of a Single Variable(I): Limits, Continuous Functions, Functions Continuous on Closed Intervals

Unit- III

Functions of a single Variable(II): The Derivative, Increasing and Decreasing Functions, Rolle's Theorem, Lagrange's Mean value Theorem, Cauchy's Mean value Theorem, Higher Order Derivatives

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Unit- IV

The Riemann Integral: Definition and Existence of the Integral, Refinement of Partitions, Darboux's Theorem, Conditions of Integrability, Integrability of the sum and difference of Integrable Functions,The Integral as a limit of sums, some Integrable Functions, Integration and Differentiation, The Fundamental Theorem of Calculus.

Textbook:

S C Malik and Savita Arora, Mathematical Analysis, Fourth Edition, New Age International Publishers

Unit I Chapter 1:2 to 5, Chapter 2:2 to 4, Chapter 3: 1,2 and 4 to 9

Unit II Chapter 4: 1 to 5, 8&10.1, Chapter 5: 1 to 3

Unit III Chapter 6:1,3&5 to 8

Unit IV Chapter9 : 1 to 9

Reference Books

1. Kenneth A Ross, Elementary Analysis-The theory of Calculus
2. William F Trench, Introduction to Real Analysis
3. Lee Larson, Introduction to Real Analysis I
4. Santi Narayan and Mittal, Mathematical Analysis
5. Brian S Thomson,Judith B Bruckner, Andrew M Bruckner, Elementary Real Analysis

Course Outcomes:

After completion of the course, students will be able to:

MT221 CO1: Interpret properties of Sequences of Real numbers.

MT221 CO2: Interpret the convergence and divergence of the series and also Analyse Continuity of Real functions and evaluating their Limits.

MT221 CO3: Interpret the concept of Derivability of Real Functions.

MT221 CO4: Summarise and synthesise the concepts of Riemann Integration.

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