

(Applicable to the batch of students admitted in the academic year 2026-2027)

B.Sc..(Mathematics) (CBCS)

FACULTY OF SCIENCE, IIMC

B.Sc.(MATHEMATICS)

Syllabus (CBCS)

(w.e.f. 2026-27)

Semester I & II



FACULTY OF SCIENCE
Department of Mathematics
INDIAN INSTITUTE OF
MANAGEMENT & COMMERCE
Autonomous College (UG & PG)

6-1-91, Khairatabad, Hyd- 500 004, T.S

Raf
Chairman
Board of Studies
Dept: of Mathematics

D. Rao
Dean (Academic)
Indian Institute of Management and Commerce
6-1-91, Khairatabad, Hyderabad-500 004.

AK
PRINCIPAL
Indian Institute of
Management & Commerce

SEMESTER- I

DIFFERENTIAL EQUATIONS

Theory : 4 hours per week and Tutorials: 1 hour per week, Credits: 5

DSC-1

Objectives: Introduce the fundamental concepts and methods of solving first-order and higher-order differential equations. Provide an understanding of the role of integrating factors, substitutions, and transformations in solving exact and reducible equations. Introduce higher-order linear differential equations, their solutions using operator methods, undetermined coefficients, and variation of parameters.

Outcomes: Solve first-order and first-degree differential equations using separable, homogeneous, linear, exact, and reducible forms. Apply the concepts of integrating factors and transformations to simplify and solve differential equations. Solve higher-order linear differential equations with constant coefficients, both homogeneous and non-homogeneous, using operator methods and the method of undetermined coefficients.

UNIT- I

Differential Equations of first order and first degree: 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. (Sec. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9)

UNIT- II

Differential Equations of first order but not of 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 First Degree in x and y – Clairaut's equation.

Applications of first order Differential Equations: Growth and Decay – Dynamics of Tumor Growth – Radioactivity and Carbon Dating – Compound Interest – Orthogonal Trajectories.
(Sec. 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 4.20)

UNIT- III

Higher order Linear Differential Equations: 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 $Q(x) = b e^{ax} / \vee e^{ax} / b \sin(ax) / b \cos(ax) / b x^k$, Method of undetermined coefficients. (Sec. 5.1, 5.2, 5.3, 5.4)

UNIT- IV

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 $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$
(Sec. 5.5, 5.6, 5.7, 5.8, 5.9 and Sec. 2.10, 2.11, 2.12)

TEXT BOOK:

1. Zafar Ahsan - *Differential Equations and Their Applications*, PHI Learning Pvt. Ltd., Third Edition, 2016.

REFERENCE BOOKS :

1. Frank Ayres Jr — *Theory and Problems of Differential Equations*: Schaum Publishing Co. (McGraw-Hill), 1952.
2. L. R. Ford — *Differential Equations*: McGraw-Hill, Second Edition, 1955
3. Daniel Murray — *Differential Equations*.
4. S. Balachandra Rao — *Differential Equations with Applications and Programs*: Sangam Books, illustrated edition, 1996.
5. Stuart P. Hastings & J. Bryce McLeod — *Classical Methods in Ordinary Differential Equations*.


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SEMESTER – II REAL ANALYSIS

Theory : 4 hours per week and Tutorials: 1 hour per week, Credits: 5

DSC-2

Objectives: To introduce the rigorous foundations of Real Analysis and highlight their importance in the development of modern mathematics. To develop the skill of analyzing the concepts of limits, continuity, and differentiability of real functions with precision. To familiarize students with classical theorems such as Rolle's Theorem, Mean Value Theorems, and the Fundamental Theorem of Calculus. To provide an understanding of Riemann integration and its applications in connecting differentiation and integration.

Outcomes: Distinguish between open, closed, countable, and uncountable sets, and analyze limit points. Apply the theory of sequences and series, including convergence tests, to solve mathematical problems. Compute and analyze Riemann integrals, apply Darboux's Theorem, and use the Fundamental Theorem of Calculus in solving problems.

UNIT-I

Real Numbers: Open Sets, Closed Sets and Countable Sets: Limit Points of a Set–Closed Sets–Countable and Uncountable Sets. (Chapter 2:Sec. 2,3,4)

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–Monotonic Sequences. (Chapter 3:Sec. 1,2,4,5,6,7,8,9)

UNIT-II

Infinite Series: Positive Term Series–Comparison tests for Positive Term Series–Cauchy's Root test–D'Alembert's Ratio Test–Integral Test–Alternating Series (Leibnitz Test). (Chapter 4:Sec. 2,3,4,5,8,10.1, 10.2)

Functions of a Single Variable (I): Limits–Continuous Functions–Functions Continuous on Closed Intervals. (Chapter 5:Sec. 1,2,3)

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. (Chapter 6:Sec. 1,3,5,6,7,8)

UNIT -IV

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. (Chapter 9:Sec. 1,2,3,4,5,6,7,8,9)

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Kenneth A. Ross – *Elementary Analysis: The Theory of Calculus*, Springer, Second Edition, 2013
2. William F. Trench – *Introduction to Real Analysis*, Prentice Hall / Pearson Education, First Edition, 2003
3. Lee Larson – *Introduction to Real Analysis I*, University of Louisville (course notes), 2014
4. Shanti Narayan & P. K. Mittal – *A Course of Mathematical Analysis*, S. Chand & Company Ltd., Revised (29th Edition), 2005
5. Brian S. Thomson, Judith B. Bruckner & Andrew M. Bruckner – *Elementary Real Analysis*, Prentice Hall, First Edition 2001; Second Edition 2008


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