Semester*	: III
Course Type	: DSC
Course Code**	: MAT-DSC-201
Name of the Course	: Real Analysis - I
Learning level**	: 250
Credits	: 4
Contact Hours	: 60
Total Marks	: 100
End Semester Marks	: 70
Internal Marks	: 30
Course Objective	

> ★ To provide a strong foundation of real analysis with a comprehensive study of the properties of real numbers, sequences, continuous and differentiable functions.

Unit - I

Algebraic properties of **R**, Order Properties of **R**, Absolute Value and the Real Line, ε-neighbourhood, boundedness of sets, least upper bound, greatest lower bound, Completeness property of **R**, boundedness of functions. Archimedean Property, Density Theorem, Intervals, Characterization of intervals, Nested Interval Property.

Unit - II

Sequence of real numbers, limit of a sequence, uniqueness of limit, recursive sequence, tails of sequences, bounded sequence, limit theorems, sum, difference, product, quotient of sequences, squeeze theorem, monotone sequences, monotone convergence theorem.

Unit - III

Subsequences, divergence criteria, monotone subsequence theorem, Bolzano-Weierstrass Theorem for sequences, Cauchy sequence, Cauchy convergence criterion, properly divergent sequences.

Unit - IV

Concept of Cluster point (Limit point) of a set in **R**, limit of a function, sequential criterion for limits, Divergence criteria, bounded function, limit theorems, squeeze theorem. Continuous functions, sequential criterion for continuity, Discontinuity criterion, combinations of continuous functions, composition of continuous functions.

Unit - V

Continuous functions on intervals, Boundedness theorem, Maximum-minimum theorem, Location of roots theorem, Intermediate value theorem, Preservation of intervals theorem. Differentiability of functions, Caratheodory's theorem, Interior-extremum

theorem, Rolle's theorem, Mean Value theorem, Intermediate value property of derivatives - Darboux's theorem.

Textbook :
1. R. Bartle and D.R. Sherbert, Introduction to Real Analysis, John Wiley and Sons.

Reference books :

1. S.C. Malik and S. Arora, Real Analysis, New Age International Publishers.
2. A. Kumar and S. Kumaresan; A basic course in real analysis; CRC Press.

Course Outcome :

After completion of this course, the learner is expected to understand how some fundamental properties of real numbers are essential for the rigorous development of real analysis. A comprehensive treatment of sequences in this course will enable the learner to appreciate and apply the sequential approach to limits and continuity. The course is expected to enhance the learner's understanding of limits, continuity and differentiabilty with a detailed analytical approach.