Course Title: Advance Mathematics- I (Real Analysis)
Course Rating: 4 Cr. Hours

Real Number System

- Ordered sets, Fields, Completeness property of real numbers
- The extended real number system, Euclidean spaces

Sequences and Series

- Sequences, Subsequences, Convergent sequences, Cauchy sequences
- Monotone and bounded sequences, Bolzano Weierstrass theorem
- Series, Convergence of series, Series of non-negative terms, Cauchy condensation test
- Partial sums, The root and ratio tests, Integral test, Comparison test
- Absolute and conditional convergence

Limit and Continuity

- The limit of a function, Continuous functions, Types of discontinuity
- Uniform continuity, Monotone functions

Differentiation

- The derivative of a function
- Mean value theorem, Continuity of derivatives
- Properties of differentiable functions.

Functions of Several Variables

- Partial derivatives and differentiability, Derivatives and differentials of composite functions
- Change in the order of partial derivative, Implicit functions, Inverse functions, Jacobians
- Maxima and minima, Lagrange multipliers

The Riemann-Stieltjes Integrals

- Definition and existence of integrals, Properties of integrals
- Fundamental theorem of calculus and its applications
- Change of variable theorem
- Integration by parts

Functions of Bounded Variation

- Definition and examples
- Properties of functions of bounded variation

Improper Integrals

- Types of improper integrals
- Tests for convergence of improper integrals
- Beta and gamma functions
- Absolute and conditional convergence of improper integrals

Sequences and Series of Functions

- Definition of point-wise and uniform convergence

- Uniform convergence and continuity
- Uniform convergence and integration
- Uniform convergence and differentiation

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

Recommended Books

1. W. Rudin, *Principles of Mathematical Analysis*, (McGraw Hill, 1976)
2. R. G. Bartle, *Introduction to Real Analysis*, (John Wiley and Sons, 2000)
3. T. M. Apostol, *Mathematical Analysis*, (Addison-Wesley Publishing Company, 1974)
4. A. J. Kosmala, *Introductory Mathematical Analysis*, (WCB Company , 1995)
5. W. R. Parzynski and P. W. Zipse, *Introduction to Mathematical Analysis*, (McGraw Hill Company, 1982)
6. H. S. Gaskill and P. P. Narayanaswami, *Elements of Real Analysis*, (Printice Hall, 1988)