M.A/M.Sc Mathematics Semester 1st

Effective from academic session 2010 ⟹ **Repetition for 2012 with minor change**

REAL ANALYSIS-I

Course No. MM-CP-102

Unit I

Infinite series: Carleman's theorem. Conditional and absolute convergence, multiplication of series, Merten's theorem, Riemann's rearrangement theorem.

Sequence and series of functions: Pointwise and uniform convergence, Cauchy criterion for uniform convergence, Weirstrauss M-test, uniform convergence and continuity, Riemann integration and differentiation, Weirstrass's Approximation Theorem, Example of a continuous nowhere differentiable function on R.

Unit II

Integration : Definition and existence of Riemann – Stieltjes integral , behavior of upper and lower sums under refinement, Necessary and sufficient conditions for RS-integrability of continuous and monotonic functions , Reduction of an RS-integral to a Riemann integral , Basic properties of RS-integrals, Differentiability of an indefinite integral of a continuous function, Fundamental theorem of calculus for Riemann integrals.

Unit III

Improper Integrals: Integration of unbounded functions with finite limits of integration. Comparison test for convergence of improper integrals, Cauchy's test, Infinite range of integration. Absolute convergence. Integrand as a product of functions. Abel's and Dirichlet's test, Elementary functions- a rigorous introduction.

Inequalities: Arithmetic-geometric means equality, Inequalities of Cauchy Schwartz, Jensen, Holder& Minkowski. Inequality on the product of arithmetic means of two sets of positive numbers.

Unit IV

Functions of several variables, directional derivative and continuity, total derivative, Matrix of a linear function, Jacobian matrix, chain rule, mean value theorem for differentiable functions. Sufficient conditions for differentiability and for the equality of mixed partials, Taylor's theorem for functions from R^n and R. Inverse and Implicit function theorems in R^n . Extremum problems for functions on R^n .Langrange's multipliers ,

Recommended Books:

1. R. Goldberg : Methods of Real Analysis
2. W.Rudin : Principles of Mathematical Analysis
3. J.M.Apostol : Mathematical Analysis
4. S.M.Shah and Saxena: Real Analysis
5. A.J.White :Real Analysis , An Introduction
6. L.Royden :Real Analysis