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**GE- 4: ELEMENTS OF ANALYSIS**

5 Lectures + 1 Tutorial per week (Ideal Tutorial Group Size: 12-15 Students)

Max. Marks: 100 (including internal assessment)

Examination: 3 hrs

**UNIT I**

Finite and infinite sets examples of countable and uncountable sets. Real line; absolute value bounded sets suprema and infima, statement of order Completeness property of  $\mathbb{R}$ , Archimedean property of  $\mathbb{R}$ , intervals. Real sequences, Convergence, sum and product of convergent sequences, proof of convergence of some simple sequences such as  $(-1)^n/n$ ,  $1/n^2$ ,  $(1+1/n)^n$ ,  $x^n$  with  $|x|<1$ ,  $a_n/n$ , where  $a_n$  is a bounded sequence, Concept of cluster points and statement of Bolzano Weierstrass' theorem, Statement and illustration of Cauchy convergence criterion for sequences, Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence

**UNIT II**

Definition and a necessary condition for convergence of an infinite series, Cauchy convergence criterion for series, positive term series, geometric series, comparison test, limit comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test. Definition and examples of absolute and conditional convergence

**UNIT III**

Definition of power series: radius of convergence, Cauchy-Hadamard theorem, statement and illustration of term-by-term differentiation and integration of power series, Power series expansions for  $\exp(x)$ ,  $\sin(x)$ ,  $\cos(x)$ ,  $\log(1+x)$  and their properties

**REFERENCES:**

- [1] R.G. Bartle and D.R. Sherbert: *Introduction to Real Analysis*, John Wiley and Sons (Asia) Pte. Ltd., 2000.
- [2] C. P. Simon and L. Blume: *Mathematics for Economists*, W W Norton and Company, 1994.
- [3] K. Sydsaeter and P.J. Hammod, *Mathematics for Economics Analysis*, Pearson Education, 2002

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15/6/16