Course Code	MTH340/540
Course Name	Real Anaysis-II
Credits	4
Course Offered to	UG+PG
Course Description	Much of mathematics relies on our ability to be able to solve equations, if not in explicit exact forms, then at least in being able to establish the existence of solutions. To do this requires a knowledge of so-called "analysis", which in many respects is just Calculus in very general settings. Real Analysis-II is a course that develops this basic material in a systematic and rigorous manner in the context of real-valued functions of a real variable. Topics covered are: Real numbers and their basic properties, Sequences: convergence, subsequences, Cauchy sequences, Open, closed, and compact sets of real numbers, Continuous functions and uniform continuity. Lebesgue out measure, Lebesgue integral, sigma algebra of Lebesgue measurable sets.

Pre-requisites

Pre-requisite (Mandatory)	Pre-requisite (Desirable)	Pre-requisite(other)
Real Analysis - I		

*Please insert more rows if required

Post Conditions*(For suggestions on verbs please refer the second sheet)

CO1	CO2	CO3	CO4	CO5
Students are introduced to fundamental properties of real numbers that lead to the formal development of real analysis	Students are able to construct rigorous mathematical proofs of basic results in real analysis	Students demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration	Students are introduced to measure theory and integration: measure space, measurable sets, sigma algebra and Lebegue measure.	

Weekly Lecture Plan

Week Number	Lecture Topic	COs Met	Assignment/Labs/Tutorial
Week 1	Ordered set, LUB, GLB, LUB property, GLB property. Construction of real numbers and their properties.	CO 1, 2	Tutorial sheet 1
Weeks 2-4	Metric spaces, Bounded sets, Open sets, closed sets, Dense sets, Compact sets, Connected sets, Perfect sets. The Cantor set.	CO 1, 2	Tutorial sheet 2
Weeks 5	Sequences, Cauchy sequences, Complete metric spaces.	CO 1-3	Tutorial sheet 3
Weeks 6-8	Limits of functions, Continuous functions, Uniform continuity, Continuity and compactness, Continuity and connectedness, Contraction map and fixed point theorem in complete metric spaces. Differentiability, Taylor's Theorem.	CO 1-3	Tutorial sheet 4
Weeks 9-10	Sequences and Series of functions, Uniform convergence, Uniform convergence and continuity, Uniform convergence and differentiation, Uniform convergence and integration, Example of a real continuous function which is nowhere differentiable.	CO 2, 3	Tutorial sheet 5
Weeks 11-13	Sigma-algebra, Measure spaces, Measurable sets; Lebesgue Measure and its properties. Measurable functions and their properties; Lebesgue integral.	CO 4	Tutorial sheet 6

*Please insert more rows if required

Weekly Lab Plan

Week Number	Laboratory Exercise	COs Met	Platform (Hardware/Software)

*Please insert more rows if required

Assessment Plan

Type of Evaluation	% Contribution in Grade
Tutorials	30
Mid-sem	30
End-sem	40

*Please insert more row for other type of Evaluation

Resource Material

Type	Title
Textbook	(1) Principles of Real Analysis, 3rd edition by Walter Rudin; (2) Real Analysis, 4th edition by H. L. Royden
Reference Books	(1) Real Analysis and foundation, 2nd edition by S.G. Krantz; (2) Introductory Analysis by J. A. Fridy