Course No	Course Name	L-T-P-Credits
MA 401	**Real Analysis**	**3-1-0: 4**

Prerequisite: nil

Course Objectives: The main objective of the course is to provide basic foundation for real analysis which will prepare the students for several other advanced topics in mathematics. The course is designed to provide rigorous treatment of the subject in terms of theory and examples which gives the students the flavour of mathematical reasoning and intuition.

Course Outcomes: After successful completion of the course, students will be able to:
1. Understand basic topology in metric spaces.
2. Understand the concepts of limit, continuity, and uniform continuity in a metric space.
3. Understand the concepts of partial derivatives, directional derivatives, total derivative and their connection with continuity for functions of several variables.
4. Understand and use inverse function theorem and implicit function theorem.
5. Recognize the difference between pointwise and uniform convergence of a sequence of functions.
6. Illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability and integrability.
7. Evaluate multiple integrals.

SYLLABUS

Module	Contents	Hours
I	Metric spaces, completeness, compactness, connectedness (with emphasis on R^n), continuity and uniform continuity.	09
II	Functions of several variables: Differentiation, inverse and implicit function theorems, Taylor series, Maxima-Minima.	10
III	Sequence and series of functions: uniform convergence, uniform convergence and continuity, Uniform convergence and integration, uniform convergence and differentiation, Weierstrass approximation theorem, equicontinuity, Ascoli's theorem.	10
IV	Multivariable integral: Fubini's Theorem.	07

Essential Readings:

1. T. M. Apostal, "Mathematical Analysis", Narosa, 2nd edition, 2002.
2. W. Rudin, "Principles of Mathematical Analysis", McGraw Hill Education, 3rd edition, 2017.

Supplementary Readings:

1. P. M. Fitzpatrick, Advanced Calculus, 2nd edition, AMS, Indian edition, 2010.
2. L. M. Graves, "The Theory of Functions of Real Variable", Dover Publications Inc, 2nd Revised edition, 2009.