Programme: B. Sc.(Hons.) Class: B.Sc.	Year: IV	Semester: VII
Subject: Mathematics		
Course Code:	**Paper: Advanced Real Analysis**	

Course Outcome

CO1: Advanced real analysis is one of the building blocks of analysis. Objective of this course is to introduce students to basic concepts of real valued functions, Riemann integrations and metric spaces.

CO2: On successful completion of the course, students will gain knowledge about concept of real valued functions, sequence and series of real valued functions, Fundamental theorem of calculus, metric spaces, connectedness and compactness of metric spaces etc.

CO3: This course has the foundation for higher courses like fixed point theory, topology, functional analysis etc.

Units	Paper Contents	Hours
I	**Sequence of Functions:** Sequence of real valued functions, pointwise and uniform convergence of sequence of functions, pointwise and uniform convergences of sequence of functions, uniform bounded sequence of functions, Cauchy's criterion for uniform convergence for sequence of functions, M_n-test, integrability and differentiability of uniform convergence sequence of functions.	12
II	**Series of Functions:** Series of real valued functions, pointwise and uniform convergence of series of functions, Cauchy's criterion for uniform convergence for series of functions, M-test, Abel's test, Dirichlet's test, Series of real valued functions, integrability and differentiability of uniform convergence series of functions. **Mean Value Theorem:** Rolle's, Lagrange's (First mean value theorem) and Cauchy's mean value theorems (Statements) with examples.	12
III	**Riemann integral:** Definition and Existence of Riemann integral, Partition, Upper sum, Lower sum, Refinement, Upper and lower Riemann integral, Properties of Riemann integral. **Fundamental Theorem of Calculus:** First and second fundamental theorem of calculus (statements) with examples.	12
IV	**Metric spaces and its properties:** Definition and examples of metric space, Open and closed balls with examples, Neighborhoods, Open and closed sets with some basic concepts, Continuous functions and its basic properties, Diagonal map, Continuity theorem for open set (only statement). Limit points and Closure of sets with some basic concepts, Derive set, Interior points of set, Basic concepts on interior of sets, Boundary of set and exterior of set with examples. **Complete metric spaces:** Convergent sequence in metric space, Cauchy sequence, Cauchy's criterion theorem, Complete metric spaces with basic properties.	12
V	**Connected spaces:** Connected and disconnected sets, some basic concepts on connectedness, locally connected spaces with examples, Totally disconnected spaces, Path, Path-connectedness with examples. **Compact spaces:** Open cover and sub cover, Compact metric space, Compact subsets, Basic results on compactness and continuity, Unions and intersections of compact subsets, Compactness of products, Local Compactness with basic concepts.	12

Suggested Books

1. Walter Rudin, Principles of Mathematical Analysis, McGraw, Hill.
2. Robert Bartle, the elements of integration and Lebesgue measure, Wiley Classics Library.
3. Gerald Folland, Real Analysis, Modern Techniques and Their Application, Wiley.
4. S.C. Malik and S. Arora, Mathematical Analysis, New Age International.
5. W. A. Sutherland, Introduction to metric and topological spaces (Second Edition), Oxford University Press, New York.
6. M. O. Searcoid, Metric spaces (Springer Undergraduate Mathematics Series), Springer, New York.
7. E. T. Copson, Metric Spaces, Phoenix Public Library, New York.

Mapping of course outcomes with program outcomes & program specific outcomes

CO'sNo.	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	2	1	1	1
CO2	3	3	3	2	1	3	2	1	1
CO3	3	2	2	2	1	2	1	1	1