TOPOLOGY

Course No: **MM24103CR** Total Credits: **04**
Semester: **M.A/M.Sc 1st Semester** Total Marks: **100**
Continuous Assessment: **Marks 20, Theory Marks: 80** Time Duration: **2½ Hrs Course**

Objectives: In inculcate the students to study the properties that are preserved through deformations, twisting and stretching of objects without tearing.
Course Outcomes: On completion of a Topology course the students shall have a clear understanding of fundamental concepts in topology, such as open and closed sets, neighborhoods, continuity, compactness, connectedness, and convergence.

UNIT - I

Review of countable and uncountable sets, Schroeder-Bernstein theorem, axiom of choice and its various equivalent forms, definition and examples of metric spaces, open and closed sets, completeness in metric spaces, Baire's category theorem, and applications to the (1) non-existence of a function which is continuous precisely at irrationals (ii) impossibility of approximating the characteristic of rationals on [0, 1] by a sequence of continuous functions.

UNIT - II

Completion of a metric space, Cantor's intersection theorem with examples to demonstrate that each of the conditions in the theorem is essential, uniformly continuous mappings with examples and counter examples, extending uniformity continuous maps, Banach's contraction principle with applications to the inverse function theorem in R.

UNIT - III

Topological spaces; definition and examples, elementary properties, Kuratowski's axioms, continuous mappings and their characterizations, pasting lemma, convergence of nets and continuity in terms of nets, bases and sub bases for a topology, lower limit topology, concepts of first countability, second countability, separability and their relationships, counter examples and behavior under subspaces, product topology and weak topology, compactness and its various characterizations.

UNIT - IV

Heine-Borel theorem, Compactness, Tychnoff's theorem, sequential compactness and total boundedness in metric spaces, Lebesgue's covering lemma, continuous maps on compact spaces, separation axioms and their permanence properties, connectedness and local connectedness, their relationship and basic properties, connected sets in $\mathbb{R}$, Uryson's lemma, Uryson's metrication lemma, Tietize's extension theorem, one point compactification.

Recommended Books:

1. G.F.Simmons, Introduction to Topology and Modern Analysis, VISIONIAS 2020.
2. J. Munkres, Topology, 2nd Edition, Pearson Education, 2021.
3. K.D. Joshi, Introduction to General Topology, New Age International Publishers, 2017.
4. J. L. Kelley, General Topology, Dover Publications Inc. Reprint Edition 2017.
5. S.T. Hu, Introduction to General Topology, Holden Day, 1958.