

MA-304: SET TOPOLOGY

Motivation and introduction, sets and their operations, countable and uncountable sets, cardinal and transfinite numbers. Topological spaces, open and closed sets, interior, closure and boundary of a set, neighborhoods and neighborhood systems, isolated points, some topological theorems, topology in terms of closed sets, limit points, the derived and perfect sets, dense sets and separable spaces, topological bases, criteria for topological bases, local bases, first and second countable spaces, relationship between separability and second countability, relative or induced topologies, necessary and sufficient condition for a subset of a subspace to be open in the original space, induced bases. Metric spaces, topology induced by a metric, equivalent topologies, formulation with closed sets, Cauchy sequence, complete metric spaces, characterization of completeness, Cantor's intersection theorem, the completion of metric space, metrizable spaces. Continuous functions, various characterizations of continuous functions, geometric meaning, homeomorphisms, open and closed continuous functions, topological properties and homeomorphisms. Separation axioms, T_1 and T_2 spaces and their characterization, regular and normal spaces and their characterizations, Urysohn's lemma, Urysohn's metrization theorem (without proof). Compact spaces their characterization and some theorems, construction of compact spaces, compactness in metric spaces, compactness and completeness, local compactness. Connected spaces, characterization and some properties of connected spaces.

RECOMMENDED BOOKS:

1. Munkres, J.R., Topology A First Course, Prentice - Hall, Inc. London, 1975.
2. Simon, G.F., Introduction to Topology and Modern Analysis McGraw-Hill, New York, 1963.
3. Pervin, W.J., Foundation of General Topology, Academic Press, London, 2nd, ed., 1965.