
MA-231 Topology — (August-December 2004)

Lectures : Monday/Wednesday/Friday 10:15 AM–11:15 AM

• • Topics

- **1. Set theory** - - - Algebra of sets, Relations, Partitions and Equivalence relations, Maps, Cartesian products, Finite, Countable and uncountable sets, Partially-ordered sets and Well-ordered sets, The Axiom of Choice and some equivalents — Tukey's lemma, Hausdorff maximality principle, Zorn's lemma, Well ordering theorem. Cardinal numbers and Ordinal numbers.
 - **2. Metric Spaces** - - - Definition and examples, Balls, Spheres, Open sets, Closed sets, Continuous maps, Homeomorphisms, Isometries, Convergence, Complete metric spaces, Banach fixed-point theorem, Baire's theorem, Completion, Function Spaces, Uniform convergence — Stone-Weierstrass theorem, Arzelà-Ascoli theorem.
 - **3. Topological Spaces** - - - Definition and examples, Elementary concepts, Open bases and open sub-bases, Function Spaces, Quotient spaces, Product Spaces, Connectedness and Compactness, Countability and Separation axioms — Urysohn's lemma, Tietze extension theorem. Topological groups, Group actions and Homogeneous spaces.
 - **4. The Fundamental Group** - - - Homotopy of Paths, The Fundamental Group, Covering Spaces, The Fundamental group of a circle, The Fundamental theorem of Algebra, Brouwer's fixed-point theorem, The Borsuk-Ulm Theorem. Homotopy type.
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• • Texts/References

- [1] **Armstrong, M. A.** : *Basic Topology*, Springer-verlag, New York-Berlin-Heidelberg-Tokyo, 1978.
- [2] **Dieudonné, J.** : *Foundations of Modern Analysis*, Academic Press, New York and London, 1960.
- [3] **Munkres, James R.** : *Topology*, Second Edition, Pearson Education (Singapore) Pte. Ltd., Indian Branch, Delhi, India, 2000.
- [4] **Simmons, G. F.** : *Introduction to Topology and Modern Analysis*, McGraw-Hill Kogakusha Ltd, Tokyo, 1963.