MATH-345 Topology-I

Credit Hours: 3-0

Prerequisite: None

Course Objectives: This course covers the fundamentals of metric and topological spaces. After the completion of this course, students would be familiar with bases, initial topology, final topology, subbase, quotient topology and completeness. They would be able to determine whether a function defined on a metric or topological space is continuous or not and what homeomorphisms are. The students would be able to determine the distance between two objects in different metric spaces.

Detailed Course Contents: Definition of Topology and Examples, Open and Closed Sets in Topology, Bases, Subbases, Link between Topology and Bases, Interior and Closure of Sets, Limits Points and Boundary of Sets, Subspace Topology, Product Topology, Quotient Topology, Continuity, Open and Closed Maps, Initial and Final Topology, Homeomorphisms, Metrics, Open Balls, Properties of Metrics, and related results, Metrizability, Convergence in metric and topological space, 1st countable and 2nd Countable space, Lindelöf Space and Separable Space, T0, T1, T2, Regular and Normal Space

Course Outcomes: Students are expected to understand:

- Basic Concepts of topology, Bases, subbases, limits, closure and boundary points
- Continuity, Open and Closed Maps,
- Homeomorphisms and Topological invariants
- Initial, Final, Subspace and Product Topology
- Metric Spaces, Properties of metric spaces Convergence in Metric and topological spaces
- 1st Countable, 2nd Countable Spaces
- Introduction to Compactness and connectedness
- T0, T1, T2, Regular and Normal Spaces

Text Books: James R. Munkres, "Topology", Prentice Hall, Inc. 2nd Edition (2000)

Reference Books:

1. S. Willard, "General Topology", Addison Wesley, (1970)
2. W. A. Sutherland, "Introduction to Metric and Topological Spaces", 2nd Edition, Oxford University Press, (2009)
3. K. D. Joshi, "Introduction to Topology", Wiley Eastern Limited, (1984)
4. M. D. Crossley, "Essential Topology", Springer, (2010)
5. R. Engelking, "General Topology", Heldermann Verlag Berlin, Volume 6, (1989)
6. C. Adams & R. Franzosa, "Introduction to Topology: Pure and Applied",

Pearson,(2009).

Weekly Breakdown

Week	Section	Topics
1	12	Definition of Topology, Examples, Coarser and Finer Topology, Open and Closed sets
2	13	Bases, Subbases, Local Bases, Link between Topology and Bases
3	14, 15	Ordered Topology, Finite Product Topology
4	16, 17	Subspace Topology, Closure of Sets, Related Results
5	17	Interior and Limit Point of sets, Boundary of set and Related results
6	18	Continuous maps and related theorems, Open and Closed Maps
7	18, 19	Homeomorphism, Topological invariants, Infinite Product Topology
8	20	Metrics, Open Balls, Closed balls and Examples, Metric Topology
9	**Mid Semester Exam**	
10	21	Properties of Metric Spaces and Metrizability, Convergence in topology and metric spaces
11	22	Quotient Topology, Initial and Final Topology
12	23, 26	Compactness and Connectedness, Some Examples
13	30	1st countable and 2nd countable space and related results
14	31	T0, T1 and T2 Spaces and Related Results
15	31	T3 and Regular Spaces and Related Results
16	32, 33	T4 and Normal Spaces and Related Results, Urysohn Lemma
17		Review
18	**End Semester Exam**	