

Topology – Course Syllabus

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Course Objective

This course introduces the fundamental concepts of topology, including topological and metric spaces, continuity, compactness, completeness, connectedness, and normed vector spaces.

Expected Background

- Basic set theory and real analysis: fundamental properties of the real numbers; real sequences, intervals, continuity, and differentiation.
- Linear algebra: vector spaces, bases, linear mappings, matrix computations, determinants, and inner products.

Topics to be covered

1. Topological and Metric Spaces

- Topological spaces; definitions, open sets, neighborhoods, accumulation points, closure of a set, interior, exterior and boundary, convergent sequences, coarser and finer topologies, continuous mappings, homeomorphisms, Hausdorff spaces...
- Metric spaces: metrics, balls, and induced topologies. Uniform continuity. Separable metric spaces.

2. Complete Metric Spaces

- Cauchy sequences. Completeness. Extension of uniformly continuous mappings. Fixed points of contraction mappings.

3. Normed Vector Spaces

- Norms. The metric induced by a norm. Equivalent norms.

4. Compact and connected Spaces

- Compact topological spaces. Compact subsets of the real line. Compact metric spaces. Connectedness.

Assessment¹: Final examination: **60%**. Continuous assessment: **40%**.

¹Five (05) absences with or without justification lead to an exclusion from the course.

References

1. N. Bourbaki, *Topologie générale*, Chapters 1–4. Hermann, Paris, 1971.
2. G. Choquet, *Cours d'analyse*, Vol. II: *Topologie*. Masson, Paris, 1964.
3. G. Christol, *Topologie*. Ellipses, Paris, 1997.
4. J. Dieudonné, *Éléments d'analyse*, Vol. I: *Fondements de l'analyse moderne*. Gauthier-Villars, Paris, 1968.
5. J. Dixmier, *Topologie générale*. Presses universitaires de France, 1981.