Course Outline: Set Topology (MAT-303)

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Objective: In this course of *Set Topology*, we will study Metric space and Topological Spaces and covers topics such as connected spaces, components, the image of a connected set through a continuous map, and path-connectedness. It delves into the properties and characteristics of these spaces, emphasizing concepts like compactness, completeness, and separation axioms. The final weeks focus on understanding the relationships between different elements within topological spaces and their applications in mathematics.

Category	**Marks**	**Details**
Sessional	30	Sessional Exams
Final Exam	50	Final Examination
Assignments (3)	9	9 marks divided into 3 assignments
Semester Project	10	Semester-long Project
Class Participation	1	Active Participation in Class
Total Marks	**100**	

Table 1: Grading Structure for the Course

Semester Project: Exploring Topological Spaces

For the Semester Project, you'll delve into the fascinating world of Topological Spaces with a focus on practical applications. The project spans five weeks, each week dedicated to reviewing and summarizing a paper on topics like *"Topological Continuous Deformation," "Applications of Topological Spaces in Distances,"* or *"Application in Data Analysis."*

Week by Week Exploration:

1. **Introduction and Overview:** Begin by familiarizing yourself with the basics of Topological Spaces, laying the foundation for the weeks ahead.
2. **Topological Continuous Deformation:** Dive into the concept of continuous deformation within topological spaces. Explore how shapes can be smoothly transformed into one another, a key aspect of topological understanding.
3. **Applications in Distances:** Uncover the practical side of Topological Spaces by studying their applications in measuring distances. Understand how these abstract concepts find real-world relevance.
4. **Data Analysis:** Explore the intersection of topology and data. Investigate how topological methods contribute to the analysis and interpretation of complex datasets.
5. **Reflection and Synthesis:** Conclude the project by reflecting on the insights gained. Summarize the main outcomes of each topic within a concise 250-word overview. Further things are discussed during the class.

This project provides an engaging opportunity to apply theoretical knowledge of topological spaces to real-world scenarios. By reviewing and summarizing five papers, you'll not only deepen your understanding but also enhance your ability to communicate complex concepts clearly and concisely. Let the

exploration begin!

Now, the week-wise topics are divide as below:

Week 1-2: Set, Function and Metric Space

- Definition of Set
- Function's Types
- Metric Spaces
- Examples of Metric Space

Week 3-4: Introduction to Topological Spaces

- Definition of topological spaces
- Examples of topological spaces
- Open and closed subsets
- Metric spaces and neighborhoods

Week 5-6: Limit Points and Accumulation Points

- Limit points
- Accumulation points
- Interior, closure, and dense subsets

Week 7-8: Exam (Sessional) and Constructing Topological Spaces

- Cartesian products
- Induced topology
- Quotient topology

Week 9-10: Continuous Maps and Homeomorphisms

- Continuous maps
- Open and closed maps
- Homeomorphisms

Week 11-12: Complete Metric Spaces and Separation Axioms

- Cauchy sequences
- Complete metric spaces
- Separation axioms

Week 13-14: Compact Spaces and Properties

– Compact spaces

– Power of compactness

– Image of a compact set through a continuous map

Week 15-16: Connected Spaces and Path-Connectedness

– Connected spaces and components

– Image of a connected set through a continuous map

– Path-connectedness

Week 17: Finial Exam

Contact Details

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