

**King Fahd University of Petroleum & Minerals**

**Department of Mathematics and Statistics**

**Comprehensive Exam Syllabus**

**MATH 521: General Topology I**

**Course Description:** Basic Set Theory (countable and uncountable sets, cartesian products). Topological spaces (basis for a topology, product topology, functions, homeomorphisms, standard examples). Connected spaces, path connectedness. Compact spaces, compactness in metrizable spaces. Countability axioms, first countable and second countable spaces. Separation axioms, Urysohn's Lemma, Urysohn's metrization theory. Complete metric spaces.

**Prerequisite:** Graduate Standing

**Main Reference:** J. Munkres, *Topology*, 2<sup>nd</sup> edition, Pearson Education Limited (2014).

(Section: 1-7, 12-21, 23-27, 30-34, 43 & 45).

**Additional References:**

- P. L. Shick, *Topology, Point-Set and Geometric*, Wiley (2007).
- S. Willard, *General Topology*, Dover Publications (2004).
- L. A. Steen, *Counterexamples in Topology*, Dover Publications (1995).

<b>Topic</b>	<b>Details</b>
Set Theory and Logic	Fundamental Concepts, Functions, Relations, The Integers and the Real Numbers, Cartesian Products, Finite Sets, Countable and Uncountable Sets
Topological Spaces and Continuous Functions	Topological Spaces, Basis for a Topology, The Order Topology, The Product Topology on $X \times Y$ , The Subspace Topology, Closed Sets and Limit Points, Continuous Functions, The Product Topology, The Metric Topology
Connectedness and Compactness	Connected Spaces, Path Connected Spaces, Connected Subspaces of the Real Line, Components and Local Connectedness, Compact Spaces, Limit Point Compactness
Countability and Separation Axioms	The Countability Axioms, The Separation Axioms, Normal Spaces, The Urysohn's Lemma, The Urysohn's Metrization Lemma
Complete Metric Spaces and Function Spaces	Complete Metric Spaces, Compactness in Metric Spaces