

## Mathematics 4351 - Topology

### Student Learning Outcomes

1. **The students will demonstrate factual knowledge including the mathematical notation and terminology used in this course.** Students will read, interpret, and use the vocabulary, symbolism, and basic definitions used in topology including set, cardinality, topology, open, closed, neighborhood, function, limit point, base, homeomorphism, connectedness, compactness, convergence, and metric.
2. **The students will describe the fundamental principles including the theorems arising from the concepts covered in this course.** Students will identify and apply definitions and theorems to various topological spaces, functions and sets. This will include applying theorems related to various separation axioms, closure, connectedness, compactness, continuity, and homeomorphisms.
3. **The students will apply the definitions, theorems and techniques covered in this course to further study or work in this or related fields.** Students will use the reasoning, techniques and factual information from this course to prove theorems related to metric spaces, topologies, and various properties. Students will demonstrate this through written assignments and oral presentations.
3. **Students will solve problems in this and related fields using techniques and procedures covered in this course.** Students will demonstrate a level of proficiency in solving mathematical problems through the acquisition of logical, theoretical, and manipulative techniques. These techniques include inference, deduction, and research skills obtained through exposure to various theorems and their respective proofs.

### Course Content

**Textbook:** *Elementary Topology*, Second Edition, by Michael C. Gemignani.

1. **Preliminaries:** Sets, relations, functions, images, inverse images.
2. **Topological Spaces:** Open sets, closed sets, neighborhoods, closure, interior, limit points, bases, sub-bases and subspaces.
3. **Continuous Functions:** Equivalent conditions for continuity, homeomorphisms, topological properties and composition of functions.
4. **Types of Topological Spaces:** Compact spaces, connected spaces, product spaces and separation properties.
5. **Metric Spaces:** Properties, sequences, convergence of sequences, metrization theorems and completeness.