

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics**  
**Syllabus Math 453**  
**AY: 2022-2023 (T221)**  
**Dr. Othman Echi**

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**Title:** Introduction to Topology

**Textbook:** P. L. Shick, *Topology, Point-Set and Geometric*, Wiley (2007).

**Description:** Topological Spaces. Basis for a topology. The order topology. The subspace topology. Closed sets and limit points. Continuous functions. The product topology. The metric topology. Connected spaces. Compact spaces. Limit point compactness. The countability axioms. The separation axioms. Urysohn's Lemma. Urysohn's Metrization theorem. Complete metric spaces.

**Learning outcomes:** A student who succeeded in this course, should be able to:

1. Define basic concepts of topology.
2. Distinguish between metric and nonmetrizable topologies.
3. Apply connectedness, compactness and Tychonoff theorem.
4. Distinguish between countability and separation axioms including countable basis, countable dense subsets, normal spaces, Urysohn lemma and Tietze extension theorem.
5. Explain metrization problem and Urysohn Metrization theorem.
6. Discuss properties and applications of complete metric spaces.

**Grading Policy:**

Exam 1	Exam 2	HW+Attendance	Presentations	Final Exam
20%	20%	10+5%	10%	35%

**Office Hours:** Every Wednesday from 09:30 to 10:30 (or by appointment).

**DN Grade:** A **DN** grade will be awarded to any student who accumulates more than **9 unexcused absences** or more than **16 excused and unexcused absences** of lectures.

A DN grade will be assigned to the eligible student after being warned twice by the instructor.

**Exams issues:**

- No student will be allowed to take the exam if not having his KFUPM ID or National/Iqama ID.
- Students are not allowed to carry mobiles, smart watches, or electronic devices to the exam halls/rooms.
- Students must take the exam in the place assigned to them.

**Missing an Exam:** In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), he must bring an official excuse from Students Affairs. Otherwise, he will get zero in the missed exam

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## Schedule

From Chapters (Textbook)	Topics	N <sup>o</sup> of Weeks
<b>2</b>	<b>Review of set theory</b> [Chapter 0 of the lecture notes]	<b>1</b>
<b>3</b>	<b>Topological spaces: definition and examples, closure, interior, exterior, boundary, basis of a topology, neighborhood of a point</b> [Chapter 1(Part 1) of the lecture notes]	<b>2</b>
<b>4, 8, 9</b>	<b>Subspaces, separation axioms, countability axioms, metric spaces, equivalent metrics</b> [Chapter 1(Part 2) of the lecture notes]	<b>2</b>
<b>4, 5</b>	<b>Limits, convergence, continuity, product spaces and quotient spaces</b> [Chapter 2 of the lecture notes]	<b>3</b>
<b>6</b>	<b>Connected Spaces</b> [Chapter 3 of the lecture notes]	<b>2</b>
<b>7</b>	<b>Compact Spaces</b> [Chapter 4 of the lecture notes]	<b>2</b>
<b>9</b>	<b>Metrizable space, metrization theorems</b> [Chapter 5 of the lecture notes]	<b>3</b>

Exams	Material	Date
<b>Exam 1</b>	Topological spaces: definition and examples, closure, interior, exterior, boundary, basis of a topology, neighborhood, subspaces, separation axioms, countability axioms, metric spaces, equivalent metrics.	TBA
<b>Exam 2</b>	Limits and continuity, product spaces, quotient spaces, connected Spaces	TBA
<b>Final Exam</b>	Comprehensive	TBA