

King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

Math 521 (General Topology I) – Semester 231

Prof. Jawad Abuhihlail

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

Objectives:

- 1) Have a general knowledge about point set topology.
- 2) Characterize metrizable spaces and be able to apply them to different aspects of Mathematics.

Learning Outcomes:

Code	CLO
1	Knowledge and Understanding
1.1	Work with sets, functions, images, preimages, and distinguish between finite, countable, and uncountable sets.
1.2	Discuss how the topology on a space is determined by the collection of open sets, by the collection of closed sets, or by a basis of neighborhoods at each point, and know what it means for a function to be continuous.
1.3	Apply the Urysohn lemma and characterize metrizable spaces.
2	Skills
2.1	Apply basic properties of connected spaces, path connected spaces, compact spaces, and locally compact spaces.
2.2	Identify what it means for a metric space to be complete, and characterize compact metric spaces.
3	Values
	Manage complex ethical and professional issues and make informed judgements on ethical codes and practices

Projects:

#	Team A	Team B	Due
I	The Axiom of Choice	History of topology	21.9.2023
II	The Klein Bottle	The Mobius Strip	26.10.2023
III	The Bohr compactification of Topological Groups	Paracompactness	17.12.2023

Textbook: J. Munkres, *Topology*, 2nd edition, Pearson Education Limited (2014).

Additional Reading:

- 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).

Grading:

First Major	Second Major	Homework	Projects/Presentations	Final Exam
20%	20%	10%	15%	35%

Syllabus

Chapter	Title	Sections	Week(s)
Ch. 1	Set Theory and Logic	1-11	1, 2
Ch. 2	Topological Spaces and Continuous Functions	12-22	3 – 5
First Major Exam: Tuesday 10.10.2023, 4:00 – 6:00 PM			
Ch. 3	Connectedness and Compactness	23-29	6 – 9
Ch. 4	Countability and Separation Axioms	30-34	10 – 12
Second Major Exam: Tuesday 14.11.2023, 4:00 – 6:00 PM			
Ch. 5	The Tychonoff Theorem	37-38	13
Ch. 7	Complete Metric Spaces and Function Spaces	43, 45	14 & 15
Final Exam (Comprehensive): January 2, 2024			

Comments:

SUNDAY	Sept. 24, 2023	National Day Holiday
SUNDAY-THURSDAY	Nov. 19, 2023 - Nov. 23, 2023	Midterm Break
SUNDAY	Dec. 17, 2023	Normal Sunday classes Last Day of classes for the term

Attendance: Students are expected to attend all lecture classes.

- If a student misses a class, he/she is responsible for any announcement made in that class.
- A DN grade will be awarded to any student who accumulates more than 20% unexcused absences or 33% excused and unexcused absences.

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Homework Assignments

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Chapter	Section	Problems	Comments
1 Due 14.9.2023	1	10	
	2	5	
	3	13, 15	
	4	8	
	5	5	
	6	3	
	7	4, 5, 6	Solve any two
	8	7	
	9	2, 5, 6, 8	Solve any two
	10	3, 5, 6, 7, 9	Solve any three
	11	4, 5, 6, 7	Solve any two
	Supplementary	2, 4, 6, 7	Solve any three
2 Due 7.10.2023	13	3, 4, 6, 8*	Solve any two including 8
	16	3, 4*, 9, 10	Solve any two including 4
	17	6*, 11, 13, 16, 19	Solve any three including 6
	18	5, 7, 9*, 11, 12	Solve any three including 9
	19	2, 7, 8, 10*	Solve any two including 10
	20	3, 5, 8*, 10	Solve any two including 8
	21	3, 7, 10, 11*	Solve any two including 11
	22	2*, 4, 6	Solve any two including 2
	Supplementary	2*, 5, 6, 7	Solve any two including 2
3 Due 2.11.2023	23	5, 8*, 11	Solve any two including 8
	24	7, 8, 12*	Solve any two including 12
	25	2, 3, 6, 10*	Solve any three including 10
	26	3, 5, 7, 8*	Solve any three including 8
	27	2, 3, 4, 6*	Solve any three including 6
	28	4, 6, 7*	Solve any two including 7
	29	4, 8, 11*	Solve any two including 11
	Supplementary	1, 2, 3*, 8, 9	Solve any two including 3
4 Due 9.11.2023	30	5, 7*, 15	Solve any two including 7
	31	4, 6, 7*	Solve any two including 7
	32	6*, 8, 9, 10	Solve any two including 6
	33	4, 6*, 10	Solve any two including 6
	34	3, 7*, 9	Solve any two including 7
	Supplementary	1*, 2, 3	Solve any two including 1
5 Due 6.12.2023	37	3, 4, 5*	Solve any two including 5
	38	2, 4, 6, 10*	Solve any three including 10
7 Due 13.12.2023	43	2, 3, 6, 8, 9*	Solve any three including 9
	45	3, 5, 8*	Solve any two including 8