هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Introduction to Topology**
Course Code:	**MAT 1315**
Program:	**Bachelor of Science in Applied Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**08/10/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 0 Lab, 2 Tutorial)					
2. Course type					
A.	☐University	☐ College	☒ Program	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 6 / Year 3					
4. Course general Description:					
The course covers fundamental concepts of topology, including open and closed sets, neighborhoods, compactness, and continuity in the context of both the real line and the plane. Students will explore metric spaces, Cauchy sequences, and properties of continuous functions, along with topological spaces, bases, and homeomorphisms. This foundational course prepares students for advanced mathematical study and applications in various fields.					
5. Pre-requirements for this course (if any):					
MAT 1311 Real Analysis					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
Topology is a fascinating branch of mathematics with applications in various fields. The main objective of the "Introduction to Topology" is to provide students with a solid understanding of topological concepts and structures, fostering critical thinking and abstract reasoning. This knowledge is essential for tackling advanced topics in analysis, geometry, and other areas of mathematics, as well as for applying topological principles in interdisciplinary fields.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours

1.	**Lectures**	30
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	30
5.	**Others (specify)**	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	To outline the fundamental concepts of metric and topological spaces.	K1, K2	4 lecture hours\week	Regular Exams
1.2	To define connected and compact spaces on the real line.	K1, K2	2 tutorial hours\week Self-study	Assignments Short Quizzes
2.0	**Skills**			
2.1	To develop techniques of problem solving in the topology of the line.	S1, S2	Real-life problems	Short Quizzes
2.2	To present basic theorems of topology for the real line clearly and precisely both orally and in writing.	S4	Self-study	Participations
2.3	To use appropriate method of proof to handle problems in topological spaces.	S5	Real-life problems	Short Quizzes
2.4	To demonstrate some proofs of theorems related to the topology of the real line.	S3	Self-study	Participations
3.0	**Values, autonomy, and responsibility**			
3.1	To work individually.	V1, V3	Personal questions	Participation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Team work	Homework and Mini-projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Topology of the line:** Open and closed sets, neighborhoods, interior points, limit points. Boundary points; closure of a set, dense sets, isolated points, cluster points. Nested intervals, Cantor's Nested Intervals Theorem, open cover of a set. Compact sets, the Heine-Borel Theorem, Bolzano-Weierstrass Theorem. Connected sets. Topology of the plane: Metrics, balls, open and closed sets in R^2, examples of other metric spaces.	**20**
2.	**Metric space:** Open and closed sets, neighborhoods, isolated, boundary, adherent and limit points, interior and closure of a set, dense sets, and separable spaces. Distance between a point and a set and between sets, diameter of a set. Sequences and limit of a sequence. Cauchy sequences and complete metric spaces. Continuous functions on metric spaces and their properties. Uniform continuity, isometric and homeomorphic spaces, equivalent metrics.	**20**
3.	**Topological space:** Open and closed sets, neighborhoods, interior points, adherent and limit points, boundary points; interior and closure of a set, dense sets. Basis, sub-basis, and equivalent bases. Continuous functions on topological spaces and their properties. Metrizable topological spaces, open and closed maps, homeomorphism; topological subspaces, Hausdorff spaces, product of topological spaces.	**20**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 5-6	25%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 15	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	**Principles of Topology, Fred H. Croom, Thomson Learning Asia 2008.**
Supportive References	**Topology: A First Course, Munkres, J.R., Prentice-Hall, Englewood Cliffs, NJ, 1st Edition 1975.** **Theory and Problems of General Topology, Seymour Lipschutz, Schaum's Outline Series, 1965.**
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Classrooms:** Equipped with whiteboards, projectors, and Smart Boards for interactive lessons and group discussions. • **Laboratories:** Feature computers with internet access, enabling hands-on activities and exploration of algebraic and trigonometric concepts. • **Exhibition Rooms:** Spaces for showcasing projects and presentations to encourage collaborative learning.
Technology equipment (projector, smart board, software)	• **Data Show Projectors:** For clear presentations in classrooms and labs. • **Smart Boards:** To enhance interactivity during lessons. • **Mathematical Software:** Essential for graphing and analysis.
Other equipment (depending on the nature of the specialty)	• **Computers:** For mini-project and homework and practical applications in laboratories. • **Advanced Calculators:** For computations and problem-solving and supporting the study of limits, continuity, and differentiation. • **Whiteboards and Markers:** To facilitate brainstorming and collaboration.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student and teaching staff	Surveys and Questionnaires
Effectiveness of Students assessment	Course Coordinator	Peer Reviews
Quality of learning resources	Students and teaching staff	Classroom Observations

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Student Representatives	Student Performance Evaluations (exams, projects) CLOs Excel sheet.
Other	**None**	

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL**
REFERENCE NO.	**8/1446**
DATE	**05/04/1446 (08/10/2024)**