Course Specification

(Postgraduate)

Course Title: **Topology and Analysis in R^n**
Course Code: **MATH640**
Program: **Master Program in Mathematics**
Department: **Mathematics**
College: **Science**
Institution: **University of Tabuk, KSA**
Version: **2**
Last Revision Date:**1/12/1443 H**

Table of Contents

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A. General information about the course:

Course Identification					
1. Credit hours:	3 H				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☐	Elective☒			
3. Level/year at which this course is offered: Level-2 or higher					
4. Course general Description Connected spaces, Path connected spaces, Components, Locally connected spaces, Quotient spaces, Separation axioms, Limit, continuity and differentiability of function of several variables, Mean value theorem, Taylor's theorem, Inverse and implicit function theorems, Smooth manifolds, Tangent spaces, Smooth functions on manifolds, Inverse and implicit function theorems on manifolds.					
5. Pre-requirements for this course (if any): None					
6. Co- requirements for this course (if any): None					
7. Course Main Objective(s)					

The main objectives of this course are include the followings:

1. Recall the basic concepts on Topology and Analysis in R^n to develop the interest of concerned subject.
2. Discuss the concepts of connected, path connected and locally connected spaces.
3. To study the concept of quotient spaces.
4. Define and discuss the concepts on separation axioms (T0 to T5 Spaces).
5. Introduce the concepts of limits, continuity and differentiability for functions of several variables.
6. Explain the Main-value, Taylor's, inverse and implicit function theorems.
7. Introduce the concepts of smooth manifold and tangent spaces. Also to prove some important theorems on manifolds.

1. Teaching mode(mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100 %
2.	E-learning		
3.	Hybrid ● Traditional classroom ● E-learning		

No	Mode of Instruction	Contact Hours	Percentage
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	3 H /week
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	45

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 The students will be able to:			
1.1	Demonstrate the advanced concepts of Topology and Analysis in R and Rn.	K1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Research project, presentation, interactive discussion and participation, Survey
1.2	Describe advance methods and topics in the field of Topology and Analysis.	K2		
1.3	Enhance an understanding to handle methods, examples and solution of problems of this subject.	K3		
2.0	Skills The students will be able to:			
2.1	Apply and justify the analytical procedures in solving problems.	S1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Research project, Home works, Assignments, presentation, interactive discussion and participation,
2.2	Using and applying the rules and results that they have learnt in this course to solve problems.	S3		
2.3	Communicate the theorems	S4		

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	and results in practical examples.			Surveys.
3.0	Values, autonomy, and responsibility The students will be able to:			
3.1	Perform work professionally and ethically	V1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Research project, Home works, Assignments, presentation, interactive discussion and participation, Surveys
3.2	Demonstrate responsibility work independently and in groups.	V2		

C. Course Content

No	List of Topics	Contact Hours
1	Some basic concepts on Topology and Analysisin R and Rn.	3
2	Advanced concepts on Topology and Analysisin R and Rn.	3
3	Connected, path connected and locally connected spaces	3
4	Connected, path connected and locally connected spaces	3
5	Quotient spaces	3
6	Open covering and compact spaces	3
7	Open covering and compact spaces	3
7	**Mid-Exam #**	--
8	Separation axioms (T3-T5)	3
9	Limits, continuity and differentiability of functions of several variables	3
10	Limits, continuity and differentiability of functions of several variables	3
11	Mean-value, Taylor's, inverse and implicit function theorems	3
12	Mean-value, Taylor's, inverse and implicit function theorems	3

13	Smooth manifolds, tangent spaces,	3
14	Smooth functions on manifolds.	3
15	Inverse and implicit function theorems on manifolds	3
16+17	**Revision & Final Exam**	
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home works and Assignments	Weekly basis	20%
2.	Mid-term exam	7th week	25%
3.	Presentation and discussion	During the Semester	15%
4.	Final Exam	At End of Semester	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	**1.** Hal Schenck , lgebraic Foundations for Applied Topology and Data Analysi, Springer International Publishing (2022) **2.** W. TuLoring, An introduction to Manifolds (2nd Edition), Springer, 2011.
Supportive References	**3.** Stephen Willard, General Topology, Dover Publication, New York, 2004.
Electronic Materials	Saudi digital library
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture Room with capacity of 30 students and equipped with White Board, Library
Technology equipment (projector, smart board, software)	Overhead projector and internet connection.

Items	Resources
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct and Indirect
Effectiveness of students assessment	Teacher	Direct
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Teacher, Quality Committee	Direct and Indirect
Other		

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

Assessment Methods(Direct, Indirect)

G. Specification Approval Data

Council / Committee	**Approval by the Department Council**
Reference No.	DEPARTMENT COUNCIL NO (26)
Date	**11/9/1444 H**