هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

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Course Title:	**Real Analysis(1)**
Course Code:	**371Math-3**
Program:	**B.Sc. of Mathematics**
Department:	**Mathematics**
College:	**Arts and Sciences**
Institution:	**Najran University**
Version:	**1**
Last Revision Date:	**07-05-2023**

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A. General information about the course:

Course Identification					
1. Credit hours:	3				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	5/3				
4. Course general Description					
This course introduces the fundamental concepts of the field of real numbers, finite and infinite sets, countable and uncountable sets. Also, it covers the basic topology of real numbers such as neighborhoods, open and closed sets, compactness and Heine-Borel theorem. The course provides knowledge of convergence for sequences and Cauchy sequences. Finally, limits, continuity, differentiation and basic theorems both in the limit, continuity and derivation are demonstrated.					
5. Pre-requirements for this course (if any): Integration Calculus (112Math-3)					
6. Co- requirements for this course (if any): None					
7. Course Main Objective(s)					
The main objective of the course is to study the topology of real numbers, sequences and Cauchy sequences, limits, continuity, uniformly continuity, differentiability and related concepts.					

1. Teaching mode (mark all that apply)

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

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
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			
1.1	Define elementary concepts regarding real numbers and the real line topology.	K1	Lecture Cooperative learning Problem solving Brain storming - Self-Learning	Assignments Midterm - Final Exam
1.2	Identify sequences, subsequences Cauchy sequences and to distinguish when a given sequence is convergent or divergent			
2.0	Skills			
2.1	Prove principal theorems of real analysis.	S2	Lecture Cooperative learning Problem solving Brain storming Self-Learning	Assignments Midterm Final Exam
2.2	Apply the appropriate test for convergence of the series.	S1		
2.3	Solve some problem related to real analysis.			
3.0	Values, autonomy, and responsibility			
3.1	Work as part of a team and independently.	V1	Homework	Oral Exam Observation Card

C. Course Content

No	List of Topics	Contact Hours
1.	Field of Real numbers (field axioms their properties, ordering axiom, Completeness axiom, well-ordering principle, density of rational numbers in the set of real numbers, Properties of absolute value, Intervals.	9
2.	Finite and infinite sets, Countable and non- countable sets. Basic Topology of real numbers: Neighborhoods, open and closed sets, compactness and Heine-Borel theorem.	9
3	Sequences (the concept of sequences, convergence of sequences, Cauchy sequences and complete real spaces**).** Infinite series, convergence, tests of convergence, absolute convergence, and conditional convergence.	6
4	Limits and continuity of functions (the concept of the limits of functions, Theorems in Limits, concept of continuity, uniformly continuity and compact (and complete) spaces.	9

5	Differentiation (concept of derivatives - concept of Differentiable functions- mean value theorem and intermediate theorem- Roll's theorem, L'Hospital's theorem and their applications, Taylor's theorem).	12
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Semester Exam1	6-8	20
2.	Assignments	During classes	10
3.	Semester Exam2	11-13	20
4.	Final Exam	18-20	50

*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	السنوسي، صالح عبدالله و القويز، محمد عبدالرحمن ،" مبادئ التحليل الحقيقي"الجزء الاول ، مكتبة الملك فهد الوطنية، الطبعة الثانية 2002م.
Supportive References	1. Fomin, S., Introductory Real Analysis, Mc Graw-Hill, New York, (Revised English translated and edited by "Siverman, R. A."), 1986. 2. Bridges, D. S., Foundations of Real and Abstract Analysis, Springer-Verlag New York, 1998.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom with 30 seats.
Technology equipment (projector, smart board, software)	- Blackboard Platform - Projector
Other equipment (depending on the nature of the specialty)	• **N/A**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Student Questionnaire (Indirect)
Effectiveness of student's assessment	Peer Reviewer	Rubrics (Indirect)
Quality of learning resources		
The extent to which CLOs have been achieved	Faculty	Direct
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Council of Mathematics Department
REFERENCE NO.	14441017-0208-00014
DATE	17-10-1444H