هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	Real Analysis 1
Course Code:	MATH 311
Program:	Bachelor of Science in Mathematics
Department:	Mathematics
College:	Science
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: 03 Hours/Week
2. Course type **a.** University ☐ College ☐ Department √ Others ☐ **b.** Required √ Elective ☐
3. Level/year at which this course is offered: **L5/Y3**
4. Pre-requisites for this course (if any): **Math 251**, **Math 200**
5. Co-requisites for this course (if any)**:** None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

In this course students will learn real numbers – algebraic properties, Completeness- arrangement properties, Open sets- closed sets, Limit points– Compact sets, Heine-Borel theorem and Weirstrass theorem, Uniform continuity, Differentiation, Mean value theorem –L'Hˆopital's rule, Convergent sequences, Limits - Theorem of limits, Upper and lower limit of sequences , Cauchy sequence, Tests of convergence : Comparison test – Root test ratio – Abel's test –Alternating series test, etc.

2. Course Main Objective

The main Objective of this course is to provide students with the basic concept of real analysis, classify uniform convergence and uniform continuity, the difference between Cauchy and convergence sequences, different types of convergence tests, some applications of real analysis.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Student will be able to define real numbers, integers, rational numbers, completeness property, Open Sets- Closed Sets, Limit Points– Compact Sets.	**K1**
1.2	Students will be able to demonstrate knowledge of procedures used in real analysis.	**K2**
2	**Skills :**	
2.1	Students will be able to analyze sequences and their limits, limit theorems, monotone sequences, sub-sequences, open and closed sets	S1
2.2	Students will be able to prove theorems of real analysis.	S2
2.3	Students will be able to apply concepts and techniques to solve problems.	S3
2.4	Students will be able to communicate with Peers and Lectures.	S4
2.5	Students will be able to use technology tools to solve problems.	S5
3	**Values:**	
3.1	Students will be able to work effectively within groups.	V1
3.1	Students will be able to manage duties and time.	V2

C. Course Content

No	List of Topics	Contact Hours
1	Real numbers – Algebraic Properties	3 Hrs
2,3	Completeness- Arrangement Properties, Open Sets- Closed Sets, Limit Points– Compact Sets	6 Hrs
4	Heine-Borel Theorem and Weirstrass Theorem	3 Hrs
5	Uniform Continuity	3 Hrs
6	**Mid-Exam 1**	
6,7	Differentiation	6 Hrs
8,9	Mean Value Theorem –L'Hˆopital's Rule	6 Hrs
10,11	Convergent Sequences, Limits - Theorem of Limits, Upper and Lower Limit of Sequences, Cauchy and Convergent Sequences	6 Hrs
11	**Mid-Exam 2**	
12,13	Tests of Convergence: Comparison Test – Root Test Ratio – Abel's Test – Alternating Series Test, etc.	6 Hrs
14,15	**Revision & Final Exam**	6 Hrs
Total		**45 Hrs**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Student will be able to define real numbers, integers, rational numbers, completeness property, Open Sets- Closed Sets, Limit Points– Compact Sets.	Introducing new ideas through case study Lectures Class Discussions	Quizzes I II Midterm Exams Final Exams Homework assignments
1.2	Students will be able to demonstrate knowledge of procedures used in real analysis.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.0	**Skills**		
2.1	Students will be able to analyze sequences and their limits, limit theorems, monotone sequences, sub-sequences, open and closed sets	Lectures Class Discussions	Quizzes I II Midterm Exams Final Exams Homework assignments.
2.2	Students will be able to prove theorems of real analysis.		
2.3	Students will be able to apply concepts and techniques to solve problems.		
2.4	Students will be able to communicate with Peers and Lectures.		
2.5	Students will be able to use technology tools to solve problems.		
3.0	**Values**		
3.1	Students will be able to work effectively within groups.	Lectures Class Discussions Group assignment	Quizzes Homework assignments
3.2	Students will be able to manage duties and time.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Weekly basis	5%
2	Homework	Weekly basis	5%
3	Quizzes	Weekly basis	10%
4	Mid Exam1	6th week	20%
5	Mid Exam2	11th week	20%
6	Final Exam	At end of the Semester	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
Six office hours per week in the lecturer schedule.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	R. G. Bartle, Elements of Real Analysis (2nd Edition), John Wiley and Sons, Inc., New York, 1976.
Essential References Materials	Berberian, Sterling K. A first course in real analysis. Springer Science & Business Media, 2012.
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	1.Lecture Room with max capacity of 30 students and equipped with White Board, Overhead projector and internet connection. 2.Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Projectors
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct and Indirect
Extent of achievement of course learning outcomes	Teachers	Direct
Quality of learning resources	Students	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	The Curriculum committee
Reference No.	
Date	25/08/2021