هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Real Analysis (1)**
Course Code:	**2023102-3**
Program:	**Bachelor in Mathematics.**
Department:	**Mathematics and Statistics Department**
College:	**Faculty of sciences**
Institution:	**Taif university**

Table of Contents

A. Course Identification

1. Credit hours:3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 8th level / 3th year
4. Pre-requisites for this course (if any)**:** Calculus II (2022104-4)
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**	**4Hr /Week**	100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers the following fundamentals of mathematical analysis: the topology of the real line and some useful elementary inequalities are mentioned. They cover the properties of the real numbers, sequences of real numbers, limits of functions, continuity, differentiability, and some applications of differentiation such as mean value theorems, L'Hospital's rule and Taylor's theorem.

2. Course Main Objective

1. Writing most essential properties of real numbers and the completeness axiom of real numbers. Introducing the algebraic and geometric structure of the real numbers
2. Recognizing the basic topological properties of the real numbers. Studying sequences of real numbers. Recognizing several tests for convergence of

sequences of real numbers. Studying continuity and uniform continuity for functions of real variables. Studying differentiability with some applications on differentiation. limit operations. Introducing the measure concepts, definitions and theorems with applications.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding:**	
1.1	Recognize the convergence for sequences of real numbers with main theorems.	K2
1.2	Identify the convergence for sequences of real numbers with main theorems.	K2
2	**Skills:**	
2.1	Explain the meaning of concepts, notations and theorems of real analysis.	S2
2.2	Demonstrate several methods for solving various problems concerning the subjects of this course.	S2
2.3	Apply some applications of differentiation.	S2
3	**Values:**	
3.1	Work effectively within groups and independently.	V1
3.2	Articulate ethical behavior associated with institutional Guidelines in classroom, and in Lab.	V3

C. Course Content

No	List of Topics	Contact Hours
1	The set R of real numbers and its algebraic properties -More properties such as maximum, minimum, supremum and infimum for any set of real numbers, The completeness axioms - Archimedean Property.	4
2	The Topolology of the real line -open sets and closed sets of real numbers -The Heine-Borel theorem-The nested set theorem- countable and uncountable sets.	4
3	Sequences of real numbers - Limits of sequences, Monotone sequences.	4
4	Cauchy sequences, Sub-sequences-Bolzano-Weierstrass theorem	4
5	Trigonometric functions, Lim sup's and Lim inf's for real sequences.	4
6	**Midterm exam,** Series of real numbers- Tests of convergence for series, Alternating series and integral tests.	4
7	Continuity - Properties of continuous functions.	4
8	Theorems for continuous - uniform continuity.	4
9	Applications of differentiation: Mean value theorems	4
10	L'Hospital's Rule- Examples on L'Hospital's Rule, Taylor's theorem With examples.	4
Total		40

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	Recognize the convergence for sequences of real numbers with main theorems.	• Lectures • Group discussions	• Exams • Assignments
1.2	Identify the convergence for sequences of real numbers with main theorems.	• Lectures • Group discussions	• Exams • Assignments
2.0	**Skills:**		
2.1	Explain the meaning of concepts, notations and theorems of real analysis.	• Interactive classes • Group discussions	• Exams • Assignments
2.2	Demonstrate several methods for solving various problems concerning the subjects of this course.	• Lectures • Group discussions • Interactive classes	• Exams • Assignments
2.3	Apply some applications of differentiation.	• Interactive classes • Group discussions	• Exams • Assignments
3.0	**Values:**		
3.1	Work effectively within groups and independently	Projects.	Through the oral presentation of the projects.
3.2	Articulate ethical behavior associated with institutional Guidelines in classroom, and in Lab.	Interactive classes	• Assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Quizzes + Home works**	**Continues**	**10 %**
2	**Midterm exam**	**5^{th}-6^{th}**	**30 %**
3	**Class Work (Homework- report- class test….)**	**8^{th}**	**10 %**
4	**Final exam**	**11^{th}**	**50 %**

***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:
6 hours per week (as defined in the teaching schedule of the faculty member) for academic advice and consultations.
Teaching staff is also available using Blackboard web site and Taif University "Edugate" System.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Peter A. Loeb; Real Analysis, 1st ed. 2016 Edition** , John Wiley & Sons, Inc., Hoboken, NJ (1995). ISBN 10: 9783319307428, ISBN 13: 978-3319307428
Essential References Materials	Michael Field "Essential Real Analysis," Springer; 1st ed. 2017 edition, **ISBN-10:** 9783319675459, **ISBN-13:** 978-3319675459 and **ASIN:** 3319675451
Electronic Materials	http://www.math-math.com/
Other Learning Materials	non

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	**Lecture halls, containing white boards, and electronic monitors - The seats fit the number of students.**
Technology Resources (AV, data show, Smart Board, software, etc.)	Laptop, smart board, and projector.
Other Resources (Specify, e.g., if specific laboratory equipment is required, list requirements or attach a list)	**Wi-Fi internet connections**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Indirect
Quality of learning resources	Peer Reviewer Students	Direct Indirect
Extent of achieving the course learning outcomes	Peer Reviewer Students	Direct 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	Department of Mathematics and Statistics
Reference No.	11
Date	12-7-1443 H

قسم الرياضيات والإحصاء
Mathematics and Statistics Department

TU جامعة الطائف TAIF UNIVERSITY