Course Specification

(Postgraduate)

Course Title: **Real Analysis**
Course Code:**MATH661**
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

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-1					
4. Course general Description In this course, we will study some basic fundamentals of Real Analysis. Some important properties, theorems, problems, and applications will be also discussed.					
5. Pre-requirements for this course (if any): None					
6. Co- requirements for this course (if any): None					
7. Course Main Objective(s) 1. Study the Behavior of real numbers, sequences and series of real numbers, and real-valued functions. 2. Discuss Some particular properties of real-valued sequences and functions that real analysis studies include convergence, limit, continuity, differentiability and integrability. 3. Use the subject in applications, showing how the principles and theory of real analysis can be applied in various settings. 4. Applications cover approximation by polynomials, Numerical Analysis, differential equations, Fourier series and approximation, wavelets, convexity, optimization and operators theory					

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		
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 theoretical concepts and definitions of Real Analysis.	K1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Research project, presentation, interactive discussion and participation, Surveys.
1.2	Describe theory and concepts of advance level of Real Analysis.	K2		
1.3	Enhance deep Knowledge and integrated understanding of the Real Analysis leading to research and practices	K3		
2.0	Skills The students will be able to:			
2.1	Applying the results and concepts in practical examples.	S1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Home works, Assignments, Research project, presentation, interactive discussion and participation, Surveys.
2.2	Analyze the complicated problems using concepts and applications of Real Analysis.	S2		
2.3	Using the accurate formulas in the analytical procedure to get the correct solutions.	S3		
3.0	Values, autonomy, and responsibility			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	The students will be able to:			
3.1	Demonstrate responsibility to solve homework and assignments on their own and submit on time.	V2	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 researches individually by using the advanced available resources.	V2		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Real Number System.	3
2	Introduction to n-Dimensional Euclidean Space.	3
3	Limit Points of a Set, Open Sets, Closed Sets,	3
4	Bolzano-Weirstrass and Heine-Borel Theorems	3
5	Sequence and Series of Real Numbers.	3
6	Limit Inferior	3
7	**Mid-Exam #**	---
7	Limit Superior, Limit of Sequences and Their Convergence	3
8	Uniform Convergence of Sequences and Series	3
9	Power Series and Fourier Series	3
10	Mean Value Theorem, Inverse Function Theorem	3
11	Implicit Function Theorem	3
12	Improper Integrals of First and Second Kind	3
13	Uniform Convergence of Improper Integrals.	3
14	Differentiation-Leibnitz Rule	3
15	Multiple Integrals and Their Evaluation by Repeated Integration	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. **Sergei Ovchinnikov**, Real Analysis: Foundations, Springer Cham (2021). 2. **M. Stoll,** Introduction to Real Analysis, 2nd Edition, Addison-Wesley Longman, Boston (2001).
Supportive References	1. **H.L. Royden,** Real Analysis, 3rd Edition, Macmillan Publishing Company Inc., USA (1993).
Electronic Materials	Digital Saudi Arabia
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.
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**