Course Specification
(Bachelor)

Course Title:	**Real Analysis 2**
Course Code:	**417MATH-2**
Program:	**B. Sc. In Mathematics**
Department:	**Mathematics**
College:	**Science**
Institution:	**Jazan University**
Version:	**2024**
Last Revision Date:	**9/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:	2

2. Course type

A.	University ☐	College ☐	Department ☒	Track☐	Others☐
B.	Required ☒		Elective☐		

3. Level/year at which this course is offered:

Level 7 / Year 4

4. Course general Description

This course is designed to provide students with

- **Riemann Integral**: Definition of Riemann integral, Riemann criterion for integrability, the integrability of monotone and continuous functions, properties of Riemann integral, First-second Fundamental Theorem, Integration by Parts, first-second substitution theorems, Mean value theorem, Tailor theorem, Improper Integrals, Liner Integrals.
- **Infinite Series**: Convergence of infinite series, tests for Convergence, Cauchy criterion for series, absolute convergence, rearrangement of Series, tests for absolute convergence, alternating series, Abel's test, Dirichlet's test.
- **Sequences and Series of Functions**: Pointwise and uniform convergences, Cauchy criterion, Weierstrass theorem, series of functions, differentiation and integration of series of functions, Uniqueness theorem, Tailor Series, Fourier Series.

5. Pre-requirements for this course (if any): Math 315

6. Co- requirements for this course (if any): none

7. Course Main Objective(s)

After finishing the course, the student is expected to be familiar with the following:

- Evaluation of the area using Riemann sums.
- Using the difference mathematical proof methods to prove some fundamental theorems in analysis
- Using the fundamental theorems to evaluate Riemann integrals
- Distinction between the uniform and pointwise convergence of sequence of functions
- Using the convergent tests of numerical series and series of functions

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	30	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	30

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	Distinguish mathematical concepts relevant to pure and applied mathematics of Riemann Integral, Infinite Series, and Sequences and Series of Functions.	K1	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
1.2	Identify structures and features of Mathematics problems in pure and applied mathematics of Riemann Integral, Infinite Series, and Sequences and Series of Functions.	K2	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
1.3	Explain required notations and concepts in pure and applied mathematics of Riemann Integral,	K3	Lectures, Web based work,	Written exam (Problem solve, MCQ,

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	Infinite Series, and Sequences and Series of Functions.		Classroom discussions.	true/false, Proof, Short answer)
2.0	Skills			
2.1	Apply aspects relevant to the pure and applied mathematics of Riemann Integral, Infinite Series, and Sequences and Series of Functions.	S1	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.2	Compute rates/quantities and Approximate Solutions in pure and applied mathematics of Riemann Integral, Infinite Series, and Sequences and Series of Functions.	S2	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.3	Apply various math rules, techniques and theorems in proving pure and applied mathematics of Riemann Integral, Infinite Series, and Sequences and Series of Functions.	S3	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
2.4	Solve mathematical problems using critical thinking and problem solving in proving pure and applied mathematics of Riemann Integral, Infinite Series, and Sequences and Series of Functions.	S4	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer)
3.0	Values, autonomy, and responsibility			
3.1	Cultivate a mathematical attitude and nurture the interest.	V1	Group work, problem solving, web based work	Assignments
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2	Group work, problem solving, web based work	Assignments
3.3	Inculcating values and ethics in thought, expression and deed.	V3	Group work, problem solving, web based work	Assignments

C. Course Content

No	List of Topics	Contact Hours
1.	**Concepts and definitions**	6
2.	**Riemann Integral**	11
3.	**Infinite Series**	9
4.	**Sequences and Series of Functions**	7
	Total	30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework and Quiz	3	5
2.	First exam	6	20
3.	Homework and Quiz	10	5
4.	Second exam	12	20
5.	Final exam	15	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	Introduction to Real Analysis, R.G. Bartle and D.G. Sherbert, 3rdEdition. John Wiley and Sons, New York,(2000)
Supportive References	-Introduction to Real Analysis, M. Stoll 2ndEdition, Addison – Wesley Longman, Boston, (2001) - Elementary Analysis: Theory of Calculus, K.A. Ross Springer-Verlag New York, (1980) - Principles of complex analysis, D. Mahmoud Kutkut, House Sunrise 1990
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom, Computer lab

Items	Resources
Technology equipment (projector, smart board, software)	Data show; Smart Board, Mathematics software
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect(Course Evaluation Survey)-Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Instructor	Direct/Indirect
The extent to which CLOs have been achieved	Students, Faculty members	Indirect
Other	Students, Program assessment committee	Direct/ Indirect

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	**Board Of Mathematics Department**
REFERENCE NO.	**2417**
DATE	**29/03/1446 A. H.; 2/10/2024 A. D.**