Form: **Course Syllabus**	**Form Number**	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
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	Deans Council Approval Decision Number	2/3/24/2023
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	Number of Pages	09

1.	**Course Title**	**Real Analysis II**
2.	**Course Number**	0301313
3.	**Credit Hours (Theory, Practical)**	3+0
	Contact Hours (Theory, Practical)	3
4.	**Prerequisites/ Corequisites**	0301213
5.	**Program Title**	B.Sc.
6.	**Program Code**	
7.	**School/ Center**	Science
8.	**Department**	Mathematics
9.	**Course Level**	Bsc
10.	**Year of Study and Semester (s)**	all semesters
11.	**Other Department(s) Involved in Teaching the Course**	
12.	**Main Learning Language**	English
13.	**Learning Types**	▮Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	▮ ▮ Moodle Microsoft Teams
15.	**Issuing Date**	13-8-2024
16.	**Revision Date**	13-8-2024

17. Course Coordinator:

Name: Dr. Saja Hayajneh	Contact hours:(S,T,W)
Office number:	Phone number:(N/A)
Email:	

18. Other Instructors:

Name: Office number: Phone number: Email: Contact hours: Name: Office number: Phone number: Email: Contact hours:

19. Course Description:

Series of real numbers: the definition and the algebraic properties. Convergence: the definition and the basic properties. Absolute and conditional convergence. Tests of absolute convergence (Ratio, nth root and comparison tests). Rearrangements of series. Abel test. Dirichlet test. Sequences of functions, the definition and examples. Pointwise convergence. Uniform convergence. Uniform convergence and continuity on [a,b]. Uniform convergence and integrability on [a,b]. Uniform convergence of sequences of derivatives. Dini's Theorem. Uniform convergence and interchange limit theorems. Series of functions: definition and basic properties. Pointwise and uniform convergence of series of functions. Weierstrass M-test. Uniformly convergent series of continuous functions. Uniformly convergent series of integrable functions. Interchange of summation and integration. The space C[a,b], the definition, metric and algebraic properties. The Weierstrass approximation theorem. Linear transformations on R^n and their matrix representation(fast revision). Functions from R^n to R^m (basic setup and examples). The derivative of vector valued functions of several variables,The definition. directional derivatives. Differentiability implies continuity. Partial derivatives. Matrix representation of the derivative. The gradiant and its properties. The chain rule. The mean value theorem. Higher order derivatives. Inverse and implicit mapping theorems (statements).

20. Program Student Outcomes (SO's):

(To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

7. Utilize research methods, critical and creative thinking skills to assess and analyze information) to solve problems properly, then draw valid reasoning and logical conclusions leading to true consequences.

21. Course Intended Learning Outcomes (CLO's):

(Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. To introduce the basic properties of real sequences and series.
2. To introduce different kinds of tests for determining the convergence of series of positiveterms.
3. To introduce the idea of absolutely convergent for series of nonnegative terms.
4. To extend the idea of convergence of sequences and series of real numbers to sequences and series of functions.
5. To introduce different kinds of convergent of sequences and series of functions, and relate them to integration,
6. continuity and differentiation.
7. To present the Weirstrass approximation Theorem and Arzela Theorem.
8. To comprehend the concept of vector forces.

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	▮	▮		▮		
2		▮	▮	▮	▮	
3	▮			▮		
4		▮		▮		
5			▮	▮	▮	
6	▮	▮				
7			▮	▮		

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program SO's / Course CLO's	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)	SO (8)
CLO (1)							▮	
CLO (2)							▮	
CLO (3)							▮	
CLO (4)							▮	
CLO (5)							▮	
CLO (6)							▮	
CLO (7)							▮	

23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL) Fully Online (FO)	Platform Used	Synchronous (S) Asynchronous (A)	Evaluation Methods	Learning Resources
		Series of real numbers, the	7		Teams	S		
	1.1	definition and						
1		the algebraic properties.		FF			quiz	Text Book

	1.2	Convergence, the definition and the basic properties.	7	FF	Teams	S	quiz	Text Book
	1.3							
	2.1	Absolute and conditional convergence.	7	FF	Teams	S	quiz	Text Book
		Tests of absolute	7		Teams	S		
2	2.2	convergence (Ratio, nth						
		root and						
		comparison tests).		FF			quiz	Text Book
	2.3							
	3.1	Rearrangements of series.	7	FF	Teams	S	quiz	Text Book
	3.2	Abel test.	7	FF	Teams	S	quiz	Text Book
3	3.3	Dirichlet test.	7	FF	Teams	S	Quiz	Text Book
	4.1	Sequences of functions, the definition and examples.	7	FF	Teams	S	quiz	Text Book
	4.2	Pointwise convergence.	7	FF	Teams	S	quiz	Text Book
4	4.3							
	5.1	Uniform convergence.	7	FF	Teams	S	quiz	Text Book
		Uniform						
5	5.2	convergence and continuity on						
		[a,b.].						
	5.3							
		Uniform convergence	7		Teams	S		
	6.1	and						
6		integrability on [a,b.].		FF			quiz	Text Book
	6.2	Uniform convergence of sequences	7	FF	Teams	S	quiz	Text Book
		of derivatives.						

	6.3							
	7.1	Dini's Theorem.	7	FF	Teams	S	quiz	Text Book
		Uniform convergence	7		Teams	S		
7	7.2	and interchange						
		limit theorems.		FF			quiz	Text Book
	7.3							
		Series of functions, the	7		Teams	S		
	8.1	definition and						
		basic properties.		FF			quiz	Text Book
8		Pointwise and uniform	7		Teams	S		
	8.2	convergence						
		of series of functions		FF			quiz	Text Book
	8.3							
	9.1	Weierstrass M-test.	7	FF	Teams	S	quiz	Text Book
		Uniformly convergent	7		Teams	S		
	9.2	series of						
9		continuous functions.		FF			quiz	Text Book
		Uniformly	7		Teams	S		
	9.3	convergent series of integrable functions.		FF			quiz	Text Book
10	10.1	Interchange of summation and integration.	7	FF	Teams	S	quiz	Text Book
	10.2	The space C[a,b], the	7	FF	Teams	S	quiz	Text Book
		definition, metric and algebraic properties.						
	10.3	The Weierstrass approximatio n theorem.	7	FF	Teams	S	quiz	Text Book

11	11.1	Linear transformatio ns on Rn and their matrix representatio n (fast revision).	7	FF	Teams	S	quiz	Text Book
	11.2	Functions from Rn to Rm (Vector fields) basic setup and examples).	7	FF	Teams	S	quiz	Text Book
	11.3	The derivative of a vector field, the definition.	7	FF	Teams	S		Text Book
12	12.1	Differentiabilit y of vector forces.	7	FF	Teams	S	quiz	Text Book
	12.2	Matrix representation of the derivative.						
	12.3							
13	13.1	The gradiant and its relation to derivative of vector forces.	7	FF	Teams	S	quiz	Text Book
	13.2	The chain rule.	7	FF	Teams	S	quiz	Text Book
	13.3							
14	14.1	The mean value theorem.	7	FF	Teams	S	quiz	Text Book
	14.2	Higher order derivatives (the second).	7	FF	Teams	S	quiz	Text Book
	14.3							
15	15.1	The inverse function theorem.	7	FF	Teams	S	quiz	Text Book
	15.2	The implicit function mapping theorem (the statement).	7	FF	Teams	S	quiz	Text Book
	15.3							
16							Final Exam	

24. Evaluation Methods:

Opportunities to demonstrate achievement of the CLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
Quiz 1	10		1,2,3	4	On campus
Quiz 2	10		2,3,4	7	On campus
Midterm exam	30		1,2,3,4,5	11	On campus
Final Exam	50		1,2,3,4,5,6,7	Final exams period	On campus

25. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

Data show, Microsoft Teams account.

26. Course Policies:

According to university regulations, attendance is mandatory. If a student is unable to attend a class, then he/she should contact the instructor. If a student misses more than 10% of the classes without excuse, then he/she will be assigned a falling grade in class. In cases of extreme emergency or serious illness, the student will be allowed to make up the missed exams. Times and dates for makeup exams will be assigned later. There are severe sanctions for cheating, plagiarizing and any other form of dishonesty. The university regulations on cheating will be applied to any student who cheats in exams or on any homework.

1. Attendance policies:
2. Absences from exams and submitting assignments on time:
3. Health and safety procedures:
4. Honesty policy regarding cheating, plagiarism, misbehavior:
5. Grading policy:
6. Available university services that support achievement in the course:

27. References:

A- Required book(s), assigned reading and audio-visuals:

Methods of real analysis, Richard R. Goldberg, John Wiley and sons, New York, 1984.

B- Recommended books, materials, and media:

1. Principles of mathematical analysis W. Rudin.
2. Mathematical analysis, Apostol.

28. Additional information:

Name of the Instructor or the Course Coordinator: **Dr. Saja Hayajneh**	Signature: ……	Date: 13-8-2024
Name of the Head of Quality Assurance Committee/ Department: **Prof. Manal Ghanem**	Signature: ……	Date: ……
Name of the Head of Department: **Prof. Baha Alzalg**.	Signature: ……	Date: ……
Name of the Head of Quality Assurance Committee/ School of Science: **Prof. Emad A. Abuosba**	Signature: ……	Date: ……
Name of the Dean or the Director: **Prof. Mahmoud I. Jaghoub**	Signature: ……	Date: ……