Form: Course Syllabus	**Form Number**	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	09

1.	**Course Title**	**Mathematical analysis 2**
2.	**Course Number**	0301311
3.	**Credit Hours (Theory, Practical)**	3+0
	Contact Hours (Theory, Practical)	3
4.	**Prerequisites/ Corequisites**	0301311
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)**	Third or fourth, 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**	11-11-2024
16.	**Revision Date**	11-11-2024

17. Course Coordinator:

Name: Khalid Bdarneh Contact hours:(S,T,W) 10:30-11:30

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18. Other Instructors:

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

19. Course Description:

As stated in the approved study plan. Liminf and limsup of sequences of real numbers: The definition using limit points. Basic properties of liminf and limsup. 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 (the general form: using liminf, and limsup.) (Ratio, nth root and comparison tests) Rearrangements of series. Abel test. Dirichlet test. Cesaro summability. Infinite product and its relation to infinite series. 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. Improper integral: Kinds of improper integral. Tests of convergence of improper integrals. Examples of functions represented by improper integral. (Gamma function, Beta function, Laplace transform)

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. Understand the definition of the limit of real sequences and series and their properties. Understand the definition of limit superior and limit inferior of real sequences
2. Understand the concept of alternating series, conditional convergent, absolute convergent and rearrangement of series.
3. Understand the definition of point-wise convergent, uniform convergent of a sequence of functions.
4. Understand some consequences and relation between uniform convergence of a sequence and series of functions continuity, differentiation and Integration.
5. Understand the proof and applications of three famous theorems, Weierstrass approximation theorem, Picard's existence theorem, and the Arzela theorem on equicontinuous families of functions.

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

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)							■	

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
1	1.1	Revision		FF	Teams	S		Text Book
	1.2	Liminf and limsup of sequences of real numbers	1	FF	Teams	S		Text Book
	1.3	Basic properties of liminf and limsup.	1	FF	Teams	S		Text Book
2	2.1	Cesaro Summability.	1	FF	Teams	S		Text Book
	2.2	Series of real numbers, the definition and the algebraic properties	1,2	FF	Teams	S		Text Book
	2.3	Convergence, the definition and the basic properties.	1,2	FF	Teams	S		Text Book

3	3.1	Absolute and conditional convergence	1,2	FF	Teams	S		Text Book
	3.2	Tests of absolute convergence (the general form: using liminf, and limsup.) (Ratio, nth root and comparison tests)	1,2	FF	Teams	S		Text Book
	3.3	Tests of absolute convergence	1,2	FF	Teams	S		Text Book
4	4.1	Tests of absolute convergence	1,2	FF	Teams	S		Text Book
	4.2	Rearrangemen ts of series.	1,2	FF	Teams	S		Text Book
	4.3	Abel test.	1,2	FF	Teams	S		Text Book
5	5.1	Dirichlet test	1,2	FF	Teams	S		Text Book
	5.2	Infinite product and its relation to infinite series	1,2	FF	Teams	S		Text Book
	5.3	Sequences of functions, the definition and examples	1,2	FF	Teams	S		Text Book
6	6.1	Pointwise convergence.	3	FF	Teams	S		Text Book
	6.2	Uniform convergence	3	FF	Teams	S		Text Book
	6.3	Uniform convergence and continuity on [a,b.]	3	FF	Teams	S		Text Book
7	7.1	Uniform convergence and integrability on [a,b.].	3	FF	Teams	S		Text Book
	7.2	Uniform convergence of sequences of derivatives	3	FF	Teams	S		Text Book
	7.3	Midterm Exam	1,2	FF	Teams	S		Text Book
8	8.1	Dini's Theorem	3	FF	Teams	S		Text Book

	8.2	Uniform convergence and interchange limit theorems	3	FF	Teams	S		Text Book
	8.3	Series of functions, the definition and basic properties	3	FF	Teams	S		Text Book
9	9.1	Pointwise convergence of series of functions.	3	FF	Teams	S		Text Book
	9.2	Uniformly convergence	3	FF	Teams	S		Text Book
	9.3	Weierstrass M-test.	3	FF	Teams	S		Text Book
10	10.1	Uniformly convergent series of continuous functions	3,4	FF	Teams	S		Text Book
	10.2	Uniformly convergent series of integrable functions	3,4	FF	Teams	S		Text Book
	10.3	More Examples	3,4	FF	Teams	S		Text Book
11	11.1	Interchange of summation and integration	3,4	FF	Teams	S		Text Book
	11.2	Interchange of summation and integration	3,4	FF	Teams	S		Text Book
	11.3	The space C[a,b], the definition, metric	3,4	FF	Teams	S		Text Book
12	12.1	Second Exam	2,3,4	FF	Teams	S		Text Book
	12.2	The space C[a,b], the algebraic properties	5	FF	Teams	S		Text Book
	12.3	The Weierstrass approximation theorem	5	FF	Teams	S		Text Book
13	13.1	Arzela theorem on equicontinuous families of functions	5	FF	Teams	S		Text Book

	13.2	Picards existence theorem	5	FF	Teams	S		Text Book
	13.3	Improper integral, the definition	5	FF	Teams	S		Text Book
14	14.1	Kinds of improper integral.	5	FF	Teams	S		Text Book
	14.2	Tests of convergence of improper integrals.	5	FF	Teams	S		Text Book
	14.3	More Examples	5	FF	Teams	S		Text Book
15	15.1	Examples of functions represented by improper integral. (Gamma unction, Beta function, Laplace transform)	5	FF	Teams	S		Text Book
	15.2	Examples of functions represented by improper integral. (Gamma function, Beta function, Laplace transform)	5	FF	Teams	S		Text Book
	15.3	Revision	1,2,3,4,5	FF	Teams	S		Text Book
16			1,2,3,4,5				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
Midterm exam	30		1,2,	8	On campus
Second exam	20		3,4	11	On campus
Final	50		1,2,3,4,5	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.

- **A.** Attendance policies:
- **B.** Absences from exams and submitting assignments on time:
- **C.** Health and safety procedures:
- **D.** Honesty policy regarding cheating, plagiarism, misbehavior:
- **E.** Grading policy:
- **F.** 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.Khalid Bdarneh**	Signature: ……	Date: 11-11-2024
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: ……