



مركز الاعتماد
و ضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER



**The University of Jordan
Accreditation & Quality Assurance Center**

Course Syllabus

Course Name: Mathematical Analysis II

Course Syllabus

1	Course title	Mathematical Analysis II
2	Course number	(0301411)
3	Credit hours	3
	Contact hours (theory, practical)	3
4	Prerequisites/corequisites	(0301311)
5	Program title	B.Sc. Mathematics
6	Program code	
7	Awarding institution	The University of Jordan
8	School	Science
9	Department	Mathematics
10	Course level	Core Specialization
11	Year of study and semester (s)	3 rd or 4 th year, 1 st and 2 nd or summer semester
12	Other department (s) involved in teaching the course	None
13	Main teaching language	English
14	Delivery method	<input type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
15	Online platforms(s)	<input type="checkbox"/> Moodle <input type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....
16	Issuing/Revision Date	Nov. 2, 2022

17 Course Coordinator:

Name: Dr. Eman Aldabbas	Contact hours: 11:30-12:30 (Sun-Tue-Thu)
Office number: Math 312	Phone number:-
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18 Other instructors:

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

19 Course Description:

As stated in the approved study plan.

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 Course aims and outcomes:

- Aims This course will introduce the students to the concept of sequence and series of functions and deepen their understanding of the series of real numbers. The main aims of this course are:

- 1- To introduce the basic properties of real sequences and series.
- 2- To introduce different kinds of tests for determining the convergence of a series of positive terms.
- 3- To introduce the idea of absolutely convergence for a 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 convergence of sequences and series of functions, and relate them to integration, continuity and differentiation.
- 6- To present the Weierstrass approximation Theorem and Arzela The

B- Students Learning Outcomes (SLOs):

Upon successful completion of this course, students will be able to:

	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)
1- Understand the definition of the limit of real sequences and series and their properties.	•						•	
2- Understand the definition of limit superior and limit inferior of real sequences.	•						•	
3- Understand the concept of alternating series, conditional convergent, absolute convergent and rearrangement of series.	•						•	
4- Understand the definition of point-wise convergent, uniform convergent of a sequence of functions	•						•	
5- Understand the definition of point-wise convergent, uniform convergent of a series of functions	•						•	
6- Understand some consequences and relation between uniform convergence of a sequence and series of functions continuity, differentiation and Integration	•						•	
7- 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.	•						•	

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Revision		Face to Face				Real Analysis Lecture Notes
	1.2	Liminf and limsup of sequences of real numbers,		Face to Face				Textbook/Lecture notes
	1.3	Basic properties of liminf and limsup. 2		Face to Face				Textbook/Lecture notes
2	2.1	Cesaro Summability.		Face to Face				Textbook/Lecture notes
	2.2	Series of real numbers, the definition and the algebraic properties		Face to Face				Textbook/Lecture notes
	2.3	Convergence, the definition and the basic properties. 2		Face to Face				Textbook/Lecture notes
Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
3	3.1	Absolute and conditional convergence. 3		Face to Face				Textbook/Lecture notes
	3.2	Tests of absolute convergence (the general form: using		Face to Face				Textbook/Lecture notes

		liminf, and limsup.) (Ratio, nth root and comparison tests).						
	3.3	Tests of absolute convergence		Face to Face				Textbook/Lecture notes
4	4.1	Tests of absolute convergence		Face to Face				Textbook/Lecture notes
	4.2	Rearrangements of series. 4		Face to Face				Textbook/Lecture notes
	4.3	Abel test.		Face to Face				Textbook/Lecture notes
5	5.1	Dirichlet test		Face to Face				Textbook/Lecture notes
	5.2	Infinite product and its relation to infinite series.		Face to Face				Textbook/Lecture notes
	5.3	Sequences of functions, the definition and examples		Face to Face				Textbook/Lecture notes
6	6.1	Pointwise convergence.		Face to Face				Textbook/Lecture notes
	6.2	Uniform convergence.		Face to Face				Textbook/Lecture notes
	6.3	Uniform convergence and continuity on $[a,b]$		Face to Face				Textbook/Lecture notes
7	7.1	Uniform convergence and integrability on $[a,b]$.		Face to Face				Textbook/Lecture notes
	7.2	Uniform convergence of sequences of		Face to Face				Textbook/Lecture notes

		derivatives.						
	7.3	Midterm Exam		On Campus				
8	8.1	Dini's Theorem.		Face to Face				Textbook/Lecture notes
	8.2	Uniform convergence and interchange limit theorems		Face to Face				Textbook/Lecture notes
	8.3	Series of functions, the definition and basic properties		Face to Face				Textbook/Lecture notes
9	9.1	Pointwise convergence of series of functions.		Face to Face				Textbook/Lecture notes
	9.2	Uniformly convergence		Face to Face				Textbook/Lecture notes
	9.3	Weierstrass M-test.		Face to Face				Textbook/Lecture notes
10	10.1	Uniformly convergent series of continuous functions		Face to Face				Textbook/Lecture notes
	10.2	Uniformly convergent series of integrable functions		Face to Face				Textbook/Lecture notes
	10.3	More Examples		Face to Face				Textbook/Lecture notes
	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources

11	11.1	Interchange of summation and integration		Face to Face				Textbook/Lecture notes
	11.2	Interchange of summation and integration		Face to Face				Textbook/Lecture notes
	11.3	The space $C[a,b]$, the definition, metric		Face to Face				Textbook/Lecture notes
12	12.1	Second Exam		On Campus				
	12.2	The space $C[a,b]$, the algebraic properties		Face to Face				Textbook/Lecture notes
	12.3	The Weierstrass approximation theorem		Face to Face				Textbook/Lecture notes
13	13.1	Arzela theorem on equicontinuous families of functions.		Face to Face				Textbook/Lecture notes
	13.2	Picards existence theorem		Face to Face				Textbook/Lecture notes
	13.3	Improper integral, the definition		Face to Face				Textbook/Lecture notes
14	14.1	Kinds of improper integral.		Face to Face				Textbook/Lecture notes
	14.2	Tests of convergence of improper integrals.		Face to Face				Textbook/Lecture notes
	14.3	More Examples		Face to Face				Textbook/Lecture notes
15	15.1	Examples of functions represented by improper integral. (Gamma		Face to Face				Textbook/Lecture notes

		function, Beta function, Laplace transform)						
	15.2	Examples of functions represented by improper integral. (Gamma function, Beta function, Laplace transform)		Face to Face				Textbook/Lecture notes
	15.3							

22 Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Midterm	30	Sequence and Series of real numbers			On Campus
Second Exam	20	Infinite product of real numbers and sequence of functions			On Campus
Final Exam	50				On Campus

23 Course Requirements

No requirements.

24 Course Policies:

A- Attendance policies: Attendance is absolutely essential to succeed in this course. You are expected to attend every class; please notify your instructor if you know you are going to be absent. If a student is absent for more than 10% of lectures without an excuse of sickness or due to other insurmountable difficulty, then he/she shall be barred from the final examination also he/she will get a failing grade in this course.

B- Absences from exams and submitting assignments on time: All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor. Students must attend all the exams, students with acceptable excuse will have an average of the other exams. Medical certificates shall be given to the University Physician to be authorized by him.

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehavior: Cheating is prohibited. The University of



Jordan regulations on cheating will be applied to any student who cheats in exams or on homework.

E- Grading policy: Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.

F- Available university services that support achievement in the course: We will use the E-learning platform to upload lecture notes and other useful material.

25 References:

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

1- 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.

26 Additional information:

Name of Course Coordinator: Dr. Eman Aldabbas

Signature: -----

Date: Nov. 2, 2022

Head of Curriculum Committee/Department: Prof. Ahmad Al Zghoul-- Signature: -----

Head of Department: -Prof. Manal Ghanem - Signature: -M. Ghanem

Head of Curriculum Committee/Faculty: ----- Signature: -----

Dean: Mahmoud Jaghoub Signature: -----