



<b>Form: Course Syllabus</b>	<b>Form Number</b>	EXC-01-02-02A
	<b>Issue Number and Date</b>	2/3/24/2022/2963 05/12/2022
	<b>Number and Date of Revision or Modification</b>	
	<b>Deans Council Approval Decision Number</b>	2/3/24/2023
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	<b>Number of Pages</b>	06

1.	<b>Course Title</b>	<b>Real Analysis</b>
2.	<b>Course Number</b>	0331711
3.	<b>Credit Hours (Theory, Practical)</b>	3
	<b>Contact Hours (Theory, Practical)</b>	3
4.	<b>Prerequisites/ Corequisites</b>	None
5.	<b>Program Title</b>	Master's in mathematics
6.	<b>Program Code</b>	
7.	<b>School/ Center</b>	Science
8.	<b>Department</b>	Mathematics
9.	<b>Course Level</b>	Master
10.	<b>Year of Study and Semester (s)</b>	
11.	<b>Other Department(s) Involved in Teaching the Course</b>	None
12.	<b>Main Learning Language</b>	English
13.	<b>Learning Types</b>	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	<b>Online Platforms(s)</b>	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams
15.	<b>Issuing Date</b>	25 – 11 – 2024
16.	<b>Revision Date</b>	28-11-2024

**17. Course Coordinator:**

Name: Saja Hayajneh	Contact hours:
Office number:	Phone number: (N/A)
Email: s.hayajneh@ju.edu.jo	



**18. Other Instructors:**

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
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**19. Course Description:**

As stated in the approved study plan.  Lebesgue outer measure as a generalization of length of an interval. Lebesgue measurable sets. Characterization of Lebesgue measurable sets. Non-measurable sets. Measurable functions and their properties. Convergence in measure. Lebesgue integral of bounded functions. Comparison of Riemann and Lebesgue integrals. Integral of non-negative measurable functions. General Lebesgue integrals. Differentiation and integration. Functions of bounded variation. Differentiation of an integral. Absolutely continuous functions. L-p -spaces.
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**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)

1. Read, analyze and write logical arguments to prove mathematical and statistical concepts and theorems.
3. Communicate with mathematical and statistical ideas clearly and consistently, in writing and verbally.
7. Work effectively within work teams and communicate scientific knowledge and results  
with peers and experts in the field.
8. Apply methodologies and ethics of scientific research in preparation of scientific research in mathematics  
field.



**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. Discuss the concept of algebra and  $\sigma$  algebra to prepare for defining the outer Measure and be able to think deeply in mathematical analysis, understand the theory of outer-measure, Lebesgue measure and measurable functions.
2. Extend the theory of integration from Riemann Integral to Lebesgue integral and compare them and introduce different kinds of convergence of a sequence of measurable functions and relate them to Lebesgue integral.
3. Introduce the concept of differentiation, bounded variations and absolutely continuous of functions and have an idea about some kind of vector valued function spaces " L-p -spaces".

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
CLO 1		•	•	•	•	
CLO 2	•	•	•	•	•	•
CLO 3		•	•	•	•	•

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

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



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 / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Introduction.	1	FF		S	Homework	Royden
	1.2	Outer Measure	1	FF		S	Homework	Royden
2	2.1	Measurable Sets and Lebesgue measure.	1	FF		S	Homework	Royden
3	3.1	A nonmeasurable Set.	1	FF		S	Homework	Royden
4	4.1	Measurable Functions.	1	FF		S	Homework	Royden
5	5.1	Littlewood's Three Principles	1	FF		S	Homework	Royden
6	6.1	The Riemann Integral.	2	FF		S	Homework	Royden
	6.2	The Lebesgue Integral of a Bounded Measurable Function over a Set of Finite Measure.	2	FF		S	Homework	Royden
7	7.1	The Integral of Nonnegative Function.	2	FF		S	Homework	Royden
8	8.1	The general Lebesgue Integral.	2	FF		S	Homework	Royden
9	9.1	. Convergence in Measure.	2	FF		S	Homework	Royden
10	10.1	Differentiation of Monotone Functions.	3	FF		S	Homework	Royden
	10.2	Functions of Bounded Variation.	3	FF		S	Homework	Royden
11	11.1	Differentiation of integral	3	FF		S	Homework	Royden
	11.2	Absolute Continuity.	3	FF		S	Homework	Royden
12	12.1	Convex Functions	3	FF		S	Homework	Royden
13	13.1	The $L^p$ - spaces.	3	FF		S	Homework	Royden
	13.2	Minkowski and Holder inequalities.	3	FF		S	Homework	Royden
14	14.1	Convergence and completeness	3	FF		S	Homework	Royden
15	15.1	Approximation in $L^p$	3	FF		S	Homework	Royden
	15.2	Bounded linear functions on the $L^p$ -s -paces	3	FF		S	Homework	Royden



#### 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
Homeworks	20		1 – 3		
Exam 1	20		1 – 2	6	On Campus
Exam 2	20		2-3	12	On Campus
Final Exam	40		1 – 3	16	On Campus

#### 25. Course Requirements:

Students should have a computer, internet connection, webcam, and account on Microsoft Teams.

#### 26. Course Policies:

1. The student is not allowed to take the course and its pre-requisite in the same time.
2. 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. All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor.
3. 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.
4. Medical certificates shall be given to the University Physician to be authorized by him. They should be presented to the Dean of the Faculty within two weeks of the student's ceasing to attend classes.
5. Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
6. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on homeworks.

**27. References:**

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

Royden, real analysis

**B-** Recommended books, materials, and media:

A. Torchinsky, Real variables

**28. Additional information:**

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Name of the Instructor or the Course Coordinator: <b>Dr. Saja Hayajneh</b>	Signature: .....	Date: 28 –11–2024
Name of the Head of Quality Assurance Committee/ Department: <b>Prof. Manal Ghanem</b>	Signature: .....	Date: .....
Name of the Head of Department: <b>Prof. Baha Alzalg</b>	Signature: .....	Date: .....
Name of the Head of Quality Assurance Committee/ School of Science: <b>Prof. Emad A. Abuosba</b>	Signature: .....	Date: .....
Name of the Dean or the Director: <b>Prof. Mahmoud I. Jaghoub</b>	Signature: .....	Date: .....