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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	Number of Pages	08

1.	**Course Title**	**Basics in Functional Analysis**
2.	**Course Number**	0331413
3.	**Credit Hours (Theory, Practical)**	3
	Contact Hours (Theory, Practical)	3
4.	**Prerequisites/ Corequisites**	0301212
5.	**Program Title**	B.Sc.
6.	**Program Code**	
7.	**School/ Center**	Science
8.	**Department**	Mathematics
9.	**Course Level**	Elective specialization requirement
10.	**Year of Study and Semester (s)**	Fourth, first or second
11.	**Other Department(s) Involved in Teaching the Course**	
12.	**Main Learning Language**	English
13.	**Learning Type**	■Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	☐Moodle ■ Microsoft Teams
15.	**Issuing Date**	4-11-2024
16.	**Revision Date**	6-11-2024

17. Course Coordinator:

Name: Prof. Abdalla Tallafha Contact hours:(M,W) 8:30-10:0

Office number: 354 Phone number:(N/A)

Email: a.tallafha@ju.edu.jo

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. Metric spaces, examples of metric spaces, open sets, closed sets, neighborhoods, convergence, Cauchy sequences, completeness. Examples of complete metric spaces, completion of metric spaces, vector spaces. Infinite dimensional vector spaces and subspaces, linearly dependent and independent, vectors, Hamel basis, normed spaces, Banach spaces, inner product spaces, Hilbert spaces, orthonormal sets and sequences, linear operators, bounded and continuous linear operators.

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 metric spaces.
2. Understand the definition of convergent and Cauchy sequences.
3. Recall the relation between metric space and topological space.
4. Explain the idea of completeness
5. Recall the definition and basic properties of vector spaces.
6. Understand the definition of inner product spaces.
7. Summarize the basic properties of inner product spaces.

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
1	1.1	Metric spaces	1	FF				
	1.2	Examples of metric spaces.	1	FF				
	1.3	Examples of metric spaces.	1	FF				
2	2.1	Open set,	3	FF				
	2.2	Closed set	3	FF				
	2.3	Neighborhood.	3	FF				
3	3.1	Convergence and Cauchy sequence.	2,4	FF				
	3.2	Completeness, examples of complete metric space	2,4	FF				
	3.3	Completeness, examples of complete metric space.	2,4	FF				

4	4.1	Completeness, examples of complete metric space.	2,4	FF				
	4.2	Completeness, examples of complete metric space. aces.	2,4	FF				
	4.3	Completion of metric spaces.	2,4	FF				
5	5.1	Completion of metric spa	2,4	FF				
	5.2	Completion of metric spa	2,4	FF				
	5.3	First Exam		FF				
6	6.1	Vector space.	5	FF				
	6.2	Vector space.	5	FF				
	6.3	Infinite dimensional vector space	5	FF				
7	7.1	Infinite dimensional vector space	5	FF				
	7.2	Subspaces	5	FF				
	7.3	Subspaces	5	FF				
8	8.1	Linearly dependent and independent.	5	FF				
	8.2	Linearly dependent and independent.	5	FF				
	8.3	Hamel basis.	5	FF				
9	9.1	Normed space.	6	FF				
	9.2	Normed space.	6	FF				
	9.3	Banach space.	6	FF				
10	10.1	Banach space.	6	FF				
	10.2	Properties of normed space.	6	FF				
	10.3	Properties of normed space.	6	FF				
11	11.1	Compactness.	5	FF				
	11.2	Compactness and finite dimensional.	5	FF				
	11.3	Linear functional.	5	FF				
12	12.1	Second Exam		FF				
	12.2	Dual spaces.	5	FF				
	12.3	Dual spaces.	7	FF				
13	13.1	Inner product space, Hilbert space, orthonormal sets	7	FF				
	13.2	Inner product space.	7	FF				
	13.3	Hilbert spaces.	7	FF				
14	14.1	Linear operators.	7	FF				
	14.2	Bounded and continuous linear operators.	7	FF				

	14.3	Bounded and continuous linear operators.	7	FF				
15	15.1	Normed space of operators.	7	FF				
	15.2	Dual space.	7	FF				
	15.3	Dual space.	7	FF				
16					Teams	S	Final Exam	Text Book

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		1,2,3,4,5	8	Exam builder
Second Exame	20		all	Every two weeks	Exam builder
Final	50		all	Final exams period	Exam builder

25. Course Requirements:

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

- Data show

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:

Introductory functional analysis with applications, Erwin Kreysszeg, John Wiley and sons, New York, 1989

B- Recommended books, materials, and media:

Fundamentals of functional analysis, S. S. Kutateladze, Springer-Science+Business Media, B. V. 1995

28. Additional information:

Name of the Instructor or the Course Coordinator: **Prof. Abdalla Tallafha**	Signature: ……	Date: 6-11-2024
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: ……