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	06

1.	**Course Title**	Special Topics in Physics
2.	**Course Number**	0302792
3.	**Credit Hours (Theory, Practical)**	3 theory
	Contact Hours (Theory, Practical)	3 theory
4.	**Prerequisites/ Corequisites**	No prerequisites
5.	**Program Title**	M.Sc. in Physics
6.	**Program Code**	
7.	**School/ Center**	Faculty of Science
8.	**Department**	Department of Physics
9.	**Course Level**	1st year
10.	**Year of Study and Semester (s)**	Fall semester 2023/2024
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**	October 2024
16.	**Revision Date**	December 2024

17. Course Coordinator:

Name: Dr. Noureddine Chair	Contact hours: (10:00-12:00) Sunday, Tuesday, Thursday
Office number: 013	Phone number: 22023
Email: n.chair@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. This course lays down the foundations for experimental and theoretical backgrounds relevant to current research topics in the department. This course should assist students in their research fields, and equip them with a wealth of advanced knowledge in physics.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. To be able to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.
2. To be able to formulate or design a scientific system, process, procedure or program to contribute achieving scientific desired needs.
3. To be able to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
4. To be able to communicate his/her scientific contributions effectively with a range of audiences.
5. To be able to recognize and demonstrate social, ethical and professional responsibilities and the impact of technical and/or scientific solutions in global economic, environmental, and societal contexts.
6. To be able to function effectively independently and on teams for establishing goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1- Lagrangian and Hamiltonian Mechanics: Develop familiarity with Lagrangian and Hamiltonian formulations and their applications in weak perturbation scenarios.

2- Operator Theory: Understand the principles of Hilbert space, operator functions, and time-dependent systems.

3- Quantized Oscillators: Explore the coordinate basis and coherent states in quantized oscillators.

4- Particle Distinction: Differentiate between Fermions and Bosons based on their statistical properties and quantum behavior.

5- Forced Oscillators: Solve problems involving forced oscillators using analytical techniques.

6- Perturbation Theory: Apply perturbation theory to solve advanced problems in physics.

7- Field Theory: Understand the concepts of free fields and the plane wave expansion for scalar and spinor fields.

8- Advanced Methods: Gain familiarity with Green's functions and Wick's theorem for practical applications in physics research.

Course ILOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	✓	✓	✓	✓		
2	✓	✓	✓	✓		
3	✓	✓	✓	✓		
4	✓	✓		✓	✓	
5	✓	✓	✓	✓		
6	✓	✓	✓	✓	✓	
7	✓	✓	✓	✓		
8	✓	✓	✓	✓	✓	

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

Program ILOs / Course ILOs	ILO (1)	ILO (2)	ILO (3)	ILO (4)	ILO (5)	ILO (6)
1	✓	✓		✓		
2	✓	✓		✓		
3	✓	✓		✓		
4	✓	✓		✓		
5	✓	✓		✓		
6	✓	✓		✓		

٢٣. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Classical theory	1	Face to Face	Microsoft Teams	Synchronous **Lecturing**	Oral Quizzes, Midterm Exam, Final Exam	QED Lecture Notes (1994) (ICTP
	1.2							
	1.3							
2	2.1	Classical theory	1					
	2.2							
	2.3							
3	3.1		2 +3					
	3.2							

	3.3	Quantized oscillators						NOTES) By J. Strathde
4	4.1 4.2 4.3	Quantized oscillators	2 +3					
5	5.1 5.2 5.3	Fermions and boson	4					
6	6.1 6.2 6.3	Fermions and boson	4					
7	7.1 7.2 7.3	The forced oscillator	5					
8	8.1 8.2 8.3	The forced oscillator	5					
9	9.1 9.2 9.3	Perturbation theory	6					
10	10.1 10.2 10.3	Perturbation theory	6					
11	11.1 11.2 11.3	Free Fields	7					
12	12.1 12.2 12.3	Free Fields	7					
13	13.1 13.2 13.3	Free Fields	7					
14	14.1 14.2 14.3	Green's functions and Wick's theorem	8					
15	15.1 15.2 15.3	Green's functions and Wick's theorem	8					

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٢٤. Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform
Midterm Exam	40%	Classical theory Quantized oscillators Fermions and boson The forced oscillator Perturbation theory Free Fields	1-7	12	On campus
Oral Exam	20%	Interacting fields	1-8	14	On campus
Final Exam	40%	All	1-8	16	On campus

٢٥. Course Requirements:

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

N/A

٢٦. Course Policies:

A- Attendance policies: According to JU by-laws.

B- Absences from exams and submitting assignments on time: According to JU by-laws.

C- Health and safety procedures: N/A

D- Honesty policy regarding cheating, plagiarism, misbehavior: According to JU by-laws.

E- Grading policy: According to JU by-laws.

F- Available university services that support achievement in the course: N/Av

2٧. References:

A- Required book(s), assigned reading and audio-visuals: Lectures of Quantum field theory by John Strathdee (ICTP) and the Classic book Quantum fled by CLAUDE ITZYKSON and JEAN-BERNARD ZUBER, McGraw-Hill, Inc, 1980 B- Recommended books, materials, and media:

2٨. Additional information:

N/A

Name of the Instructor or the Course Coordinator: …… Noureddien Chair ……	Signature: N-Chair	Date: 10/2024
Name of the Head of Quality Assurance Committee/ Department ……	Signature: ……..……	Date: ……..……
Name of the Head of Department ……	Signature: ……..……	Date: ……..……
Name of the Head of Quality Assurance Committee/ School or Center ……	Signature: ……..……	Date: ……..……
Name of the Dean or the Director ……	Signature: ……..……	Date: ……..……