مركز الاعتماد وضمان الجودة
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Course Syllabus

1	**Course title**	Nuclear Physics
2	**Course number**	0302463
3	**Credit hours**	3
	Contact hours (theory, practical)	3 hours weekly (theory)
4	**Prerequisites/corequisites**	Quantum Mechanics-1
5	**Program title**	B.Sc. in Physics
6	**Program code**	
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Physics
10	**Course level**	4th year
11	**Year of study and semester(s)**	
12	**Other department(s) involved in teaching the course**	
13	**Main teaching language**	English
14	**Delivery method**	☐Face to face learning ☒Blended ☐Fully online
15	**Online platforms(s)**	☐Moodle ☒Microsoft Teams ☐Skype ☐Zoom ☐Others……
16	**Issuing/Revision Date**	

17 Course Coordinator:

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

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.

The course deals with:

- The properties of atomic nuclei and its macroscopic description (size, shape, mass, stability, collective excitation)
- Laws for radioactive decay and different decay paths of the atomic nuclei (fission, alpha decay, beta decay, electromagnetic transitions, etc.)
- Basic properties of the interaction between nucleons (nucleon-nucleon scattering and the deuteron)
- Introduction to the shell model - the microscopical approach
- Nuclear reactions (cross-sections, resonance, reaction mechanisms).
- Applications of nuclear physics for the benefit of the society: Fission and Nuclear Power Plants, environment and society applications

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20 Course aims and outcomes:

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A- Aims:

Providing students with a robust understanding of the basic principles and concepts of nuclear physics that are appropriate for advanced studies or for work in the field of nuclear physics and technology.

B- Students Learning Outcomes (SLOs):

For purposes of mapping the course SLOs to the physics program SLOs, at the successful completion of the physics program, graduates should acquire:

1. An ability 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. An ability to formulate or design a system, process, procedure or program to meet desired needs.
3. An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.
5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.
6. An ability to function effectively in teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

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

Program / SLOs / Course SLOs	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)
1. **Knowledge and understanding:** Explain properties and structure of atomic nuclei	✓	✓	✓	✓		
2. **Knowledge and understanding:** Describe different models for atomic nuclei and their limitations	✓	✓	✓	✓		
3. **Knowledge and understanding:** Exemplify and explain different nuclear reactions	✓	✓	✓	✓		
4. **Knowledge and understanding:** Exemplify the interaction between science and technology and the application of nuclear physics in society	✓	✓	✓	✓		
5. **Competence and skills:** Apply basic quantum mechanical	✓	✓	✓	✓	✓	✓

concepts and methods in nuclear physics							
6. **Competence and skills:** Exemplify and in general terms get oriented about current research in nuclear physics	✓	✓	✓	✓	✓	✓	
7. **Competence and skills:** Use numerical problem-solving approach to tackle nuclear properties, problems and data analysis	✓	✓	✓	✓			
8. **Judgement and approach:** Estimate and anticipate the applicability and the limitations of models of the atomic nucleus					✓	✓	
9. **Judgement and approach:** Present oral and written reports in the subject of nuclear physics where the students have independently acquired, assessed and used new knowledge					✓	✓	
10. **Judgement and approach:** Explain and give examples of how nuclear physics relates to other fields in physics					✓	✓	
11. **Judgement and approach:** Explain and give examples of nuclear physics and in particular the role of the nuclear power in society.					✓	✓	
12. **Judgement and approach:** Summarize and reflect on own progress for knowledge and skills based on intended course learning outcomes.					✓	✓	

21. Topic Outline and Schedule

week	lecture	Topic	SLOs	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Basic nuclear	1-6					
	1.1							

	1.3	concepts and nuclear properties		Blended	Microsoft Teams		Homeworks, Projects, Midterm Exam, Final Exam	Krane, S., *"Introductory Nuclear Physics"*John Wiley (1987) (or any similar reference).
2	2.1							
	2.2							
	2.3							
3	3.1	Nuclear force deuteron problem, nucleon scattering	1-4					
	3.2							
	3.3							
4	4.1							
	4.2							
	4.5							
5	5.1							
	5.2							
	5.3							
6	6.1							
	6.2							
	6.3							
7	7.1	Nuclear models	1-4					
	7.2							
	7.3							
8	8.1							
	8.2							
	8.3							
9	9.1							
	9.2							
	9.3							
10	10.1							
	10.2							
	10.3							
11	11.1	Nuclear decay and radioactivity	1,2,3,5					
	11.2							
	11.3							
12	12.1							
	12.2							
	12.3							
13	13.1	Nuclear reactions: an introduction	1-6					
	13.2							
	13.3							
14	14.1							
	14.2							
	14.3							
15	15.1	Applications of nuclear physics	1-6					
	15.2							
	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
Homework, project	30%	All	1-6	All	paper
Midterm Exam	30%	1-6 weeks	1-6	9	Paper Exam
Final Exam	40%	All	1-6	16	Paper Exam

23 Course Requirements

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

Textbook, computer, and internet access.

24 Course Policies:

A- Attendance policies:

Students are expected to attend all classes. Absence should not exceed 15%.

B- Absences from exams and submitting assignments on time:

Exam makeups will be arranged for students with valid absence excuses.

C- Health and safety procedures:

Students are required to abide by all mandated health and safety procedures.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

Cheating, plagiarism, and misbehavior will be dealt with according to University regulations.

E- Grading policy:

Homeworks&projects: 30%, Midterm Exam: 30%, Final Exam: 40%.

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

Microsoft Teams, E-Learning platform, Moodle.

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25 References:

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

Krane, S., *"Introductory Nuclear Physics"*John Wiley (1987)

B- Recommended books, materials and media:

1 Carlos A. Bertulani, “Nuclear Physics in a Nutshell”, University Press, 2007
2 W.E. Meyerhof, "Elements of Nuclear physics"
3 . B.L. Cohen, "Concepts of Nuclear physics"
4 . P.E. Hodgson,E. Gadioli and E. Gadioli Erba, "Introductory Nuclear physics"
5 . H. Enge, "Introduction to Nuclear Physics".

26 Additional information:

Name of Course Coordinator: Prof. Khalifeh AbuSaleem Signature: Date:
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------