هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Nuclear Physics 1**
Course Code:	**461PHYs**
Program:	**Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Jazan University**
Version:	**Phys2215**
Last Revision Date:	**06/04/1444 H**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	4				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	**Level 10/ Year 4**				
4. Course general Description This course is to provide knowledge and understanding of the basics of nuclear physics like nuclear properties, nuclear force, nuclear structure, radioactivity, reactions, and power production to enable progression to a postgraduate course or to provide a platform for entering industry.					
5. Pre-requirements for this course (if any): 352 PHYS					
6. Co- requirements for this course (if any): NIL					
7. Course Main Objective(s) This course is designed to provide students with: - The fundamental of nuclear physics and its scale. - The basic properties of the nuclear force. - The structure of the nucleus under different nuclear models. - The stability of nuclei and their decay. - The fission process and the basics of the nuclear reactor. - The fusion process and how intermediate and heavy elements are created in the stars.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	**28**	**85%**
2.	E-learning	**5**	**15%**
3.	Hybrid ● Traditional classroom ● E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	**30**
2.	Laboratory/Studio	--
3.	Field	
4.	Tutorial	
5.	Others (specify)	3
	Total	**33**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	**Define:** The atomic number Z – the mass number – Isotopes – isobars – isotones - atomic mass unit- The binding energy - the Q-value – half life time-decay constant – cross section – reaction rate – flux	PLO1.1		**Direct** (formative and summative): In class interactive questioning, Quizzes, mid-term exams **Indirect**: student survey
1.2	**Describe:** Nuclear structure, nuclear volume and nuclear density, nuclear angular momentum, nuclear electric quadrupole moment – nuclear force – shell model – liquid drop model – fermi gas model- alpha decay – beta decay – gamma decay – carbon	PLO1.1		**Direct** (formative and summative): In- class interactive questioning, Quizzes, mid-term exams **Indirect**: student survey

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	dating – compound nucleus – nuclear reactor			
1.3	**Discuss** excited states and stability, nuclear reaction, nuclear fission, nuclear fusion.`	PLO1.2	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, Quizzes, mid-term exams and final exam **Indirect**: student survey
2.0	Skills			
2.1	**Calculate** binding energy and mass defect, atomic weight, nuclear force, nuclear density, angular momentum, Q-value, nuclear energy	PLO2.2	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, Quizzes, mid-term exams and final exams **Indirect**: student survey
2.2	**Solve** the problems related with radioactive decay	PLO2.1	Lectures, discussion	
2.3	**Evaluate** liquid drop model, shell model, nuclear force and exchange force	PLO2.1	Lectures, discussion	
2.4	**Develop** communication and critical thinking competencies during interactive discussion, group assignments, essays or web-based activities	PLO2.4	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, Quizzes, mid-term exams **Indirect**: student survey

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	**Show** effective collaboration and bear individual responsibility during group work and/or assignments	PLO3.1	Individual and group practices- Brain storming – free related small web-based topics	**Direct** (formative and summative): Case study- reports project work presentation **Indirect**: student survey
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	**Nuclear Properties:** Nuclear scale, units, size and density, quadrupole moment, Notation, isotopes, the nuclear chart (Nuclear landscape), how to write a nuclear reaction, Binding Energy BE, Q-value.	**8**
2.	**Nuclear forces:** exchange force, proton potential well and neutron potential wells, nuclear force.	**6**
3	**Nuclear models:** Fermi gas model, Liquid drop model, Shell model, deformation.	**6**
4	**Radioactivity:** Types of radiation, - Alpha , - Beta+ , Beta-, - Gamma, Electron capture, decay chains, Uses of Radioactivity, Radioactivity decay law, Half-life, life time, nuclear dating, Carbon, Rock dating	**7**
5	**Nuclear reactions:** The conservation laws, types of reaction, Elastic, Inelastic, Transfer, Compound, Fission, why fission happens, spontaneous, induced (controlled), nuclear reactor., Fusion, p-p cycle, CNO cycle, nucleosynthesis.	**6**
Total		33

D. Students As

sessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Mid-term Exam**	**6**	**20(20%)**
2.	Course work activities (H.W, Quizzes, other assignments)	distributed	**30(30%)**
3.	**Final Exam**	**12**	**50**
...			

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Introductory Nuclear Physics, Krane K.S. Wiley, New York, (1987).
Supportive References	Nuclear and Particle Physics, Williams W.S.C Clarendon Press, Oxford, (1991).
Electronic Materials	http://hyperphysics.phy-astr.gsu.edu
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**1 Lecture room(s) for groups of 50 students.**
Technology equipment (Projector, smart board, software)	**1 Computer laboratories each for groups of 25 students.**
Other equipment (Depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer, and program leader	Indirect (CES)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Students, Faculty members	Indirect
The extent to which CLOs have been achieved	Instructor	Direct/Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	DEPARTMENT BOARD
REFERENCE NO.	PHYS2304
DATE	28/2/2023