2023
TP-153

Course Specification
(Bachelor)

Course Title:	*Nuclear Physics I*
Course Code:	*PHYS 481*
Program:	*Bachelor*
Department:	*Physics and Astronomy*
College:	*College of Science*
Institution:	*King Saud University*
Version:	*2*
Last Revision Date:	*September, 13th, 2023*

Table of Contents

A. General information about the course: 3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods 4
C. Course Content 5
D. Students Assessment Activities 6
E. Learning Resources and Facilities 6
F. Assessment of Course Quality 7
G. Specification Approval 8

A. General information about the course:

1. Course Identification

1. Credit hours: (3+0+0)					
2. Course type					
A.	University	College	■ Department	Track	☐ Others
B.	■ Required		Elective		
3. Level/year at which this course is offered: (7th level / 4th year)					
4. Course general Description:					

This course covers basic concepts of nuclear physics with emphasis on nuclear structure and interactions of radiation with matter. Topics covered by the course include elementary quantum theory; nuclear properties; nuclear forces; nuclear models; alpha, beta and gamma radioactive decays; interactions of nuclear radiations (charged particles and gammas) with matter; nuclear reactions; fission and fusion.

5. Pre-requirements for this course (if any)**:**

(PHYS353) Modern Physics I

6. Pre-requirements for this course (if any)**:**

7. Course Main Objective(s):

1. Identify the basic nuclear properties and nuclear models.
2. Understand the main forces that govern the nuclear systems.
3. Identify the different nuclear models.
4. Describe the radioactive decays and the interaction of radiation with matter.
5. Identify the nuclear reactions.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning	0	0

No	Mode of Instruction	Contact Hours	Percentage
3	Hybrid • Traditional classroom • E-learning	0	0
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1	Lectures	45
2	Laboratory/Studio	0
3	Field	0
4	Tutorial	0
5	Others (specify)	0
Total		45

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	Demonstrate knowledge of the basic theories and principles of the general aspects of nuclear physics	**K1**	Lecture, Smart Board	Exams, QZs, Presenta6on and homework
1.2	Recognize appropriate tools and techniques that may be used to solve problems related to nuclear physics	**K2**	Lecture, Smart Board	Exams, QZs, Presenta6on and homework

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.3	Describe and comment on the different methodologies in nuclear physics field	**K3**	Lecture, Smart Board	Exams, QZs, Presenta6on and homework
2.0	**Skills**			
2.1	Solve quantitative and qualitative problems of familiar and unfamiliar nature which are related to nuclear physics field	**S1**	Lecture, Smart Board	Exams, QZs, Presenta6on and homework
2.2	Understand the basics physical concepts of nuclear physics	**S2**	Lecture, Smart Board	Exams, QZs, Presenta6on and homework
3.0	**Values, autonomy, and responsibility**			
3.1	Present oral and written scientific projects related to nuclear physics field	**V1**	Lecture, Smart Board	Exams, QZs, Presenta6on and homework
3.2	Work as a team	**V2**	Lecture, Smart Board	Exams, QZs, Presenta6on and homework

C. Course Content

No	List of Topics	Chapter#	Section#	Contact Hours
1	**Basic concepts**	1	all	**3**
2	**Elements of quantum mechanics**	2	5,6	**5**
3	**Nuclear properties**	3	all	**6**
4	**The forces between nucleons**	4	1, 4, 5	**8**
5	**Nuclear models**	17	7, 8,9	**7**

6	**Nuclear decay and radioactivity**	10, 8, 9,10	10-1,10-2,10-3,10-4,10-5 8-2, 8-4 9-1 10-1,10-6	**9**
7	**Nuclear reactions**	11	11-1, 11-2, 11-4, 11-6	**7**
Total				**45**
		اللون الأحمر من كتاب I. Kaplan	اللون الأسود من كتاب K. Krane	

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1	**First midterm exam**	**week 6**	**20%**
2	**Second midterm exam**	**week 10**	**20%**
3	**Class activities (Homework, quizzes, small research projects)**	**weekly**	**20%**
4	**Final exam**	**week 16-18**	**40%**

*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	1. Introductory Nuclear Physics , Kenneth S. Krane, John Wiley & Sons, 2nd edition,1988. 2. Nuclear Physics, Irving Kaplan, Addison Wesley Publishing Company, 2nd edition, 1977.
Supportive References	Nuclear Physics in a Nutshell, Carlos A. Bertulani, Princeton University Press, 2007.
Electronic Materials	Particle accelerators official websites (CERN, SLAC…etc)

Other Learning Materials	**Selective websites such as:** • https://www.nndc.bnl.gov/ • https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype • https://www.ans.org/nuclear/

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classrooms**
Technology equipment (projector, smart board, software)	**White board and Blackboard**
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students/per reviewer	direct/ indirect
Effectiveness of Students assessment	Faculty	direct
Quality of learning resources	Students	indirect
The extent to which CLOs have been achieved	Faculty	indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physics Department's council
REFERENCE NO.	7th (1st term/1445)
DATE	15/05/1445