هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Nuclear Physics 2**
Course Code:	**PHY3602**
Program:	**BSc. Physics**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm AL-Qura University**

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 8 /3st Year
4. Pre-requisites for this course (if any): Nuclear Physics (1)
5. Co-requisites for this course (if any): Not applicable (N. A)

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100 %
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description The course will cover the principles and basics of the advanced subjects in nuclear physics in nuclear reactions, neutron physics, nuclear fission, nuclear fusion, elementary particles.
2. Course Main Objective To provide the scientific and technical background needed to proper understanding of the advanced subjects in nuclear physics mentioned in the course description

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	Knowledge:	

CLOs		Aligned PLOs
1.1	Demonstrate the fundamentals and basic concepts of advanced subjects in nuclear physics in nuclear reactions, neutron physics, nuclear fission, nuclear fusion, elementary particles. During the lab work, the student will explore nuclear physics knowledge.	K1(P) K2(P)
2	Skills:	
2.1	To know how to assess, evaluate, or calculate the following: reaction energetics, reaction cross section, fission yield and fission, as well as practicing nuclear physics knowledge in the lab.	S1(P)
2.2	Effectively communicates physics concepts, processes, and results, both orally and in writing related to nuclear physics	S2(P)
3	Values:	
3.1	Works responsibly and effectively within the work team to practice and interact with the principles and concepts of nuclear physics	V1(P) V2(P)

C. Course Content

No	List of Topics	Contact Hours
1	**NUCLEAR REACTIONS:** Types of Reactions and Conservation Laws Energetics of Nuclear Reactions Isospin Reaction Cross Sections Experimental Techniques Coulomb Scattering Nuclear Scattering Scattering and Reaction Cross Sections The Optical Model Compound-Nucleus Reactions Direct Reactions Resonance Reactions Heavy-Ion Reactions	6
2	**NEUTRON PHYSICS** Neutron Sources Absorption and Moderation of Neutrons Neutron Detectors Neutron Reactions and Cross Sections Neutron Capture Interference and Diffraction with Neutrons	6

3	**NUCLEAR FISSION** Basic Fission Process Characteristics of Fission Energy in Fission Fission and Nuclear Structure Controlled Fission Reactions Fission Yield and Fission Products A Natural Fission Reaction	10
4	**NUCLEAR FUSION** Basic Fusion Processes Characteristics of Fusion Solar Fusion Applications of Nuclear Fusion	4
5	**ELEMENTARY PARTICLES** Leptons Lepton multiplets and lepton numbers Neutrinos Neutrino mixing and oscillations Universal lepton interactions Quarks Quark generations and quark numbers Hadrons Flavour independence and charge multiplets Quark model spectroscopy Hadron masses and magnetic moments	4
	Practical Part: Students will conduct various experiments in the practical part of the course. Each student will perform the experiment, collect data, extract result, and prepare a written report every week.	10
Total		40

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate the fundamentals and basic concepts of advanced subjects in nuclear physics in nuclear reactions, neutron physics, nuclear fission, nuclear fusion, elementary particles. During the lab	1.Lecture method: Board and PowerPoint. 2.Begin the lecture with a brief idea of the topic. 3.Demonstrate the basic principles. 4.Discussing phenomena with illustrating pictures and diagrams.	• Midterm exams. • Final exam. • Homework. • Oral Questions.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	work, the student will explore nuclear physics knowledge.	5.Solve problem 6.Brain storming	
2.0	**Skills**		
2.1	To know how to assess, evaluate, or calculate the following: reaction energetics, reaction cross section, fission yield and fission, as well as practicing nuclear physics knowledge in the lab.	1.Lecture method: Board and PowerPoint. 2.Interactive group work 3.Demonstrate the basic principles. 4.Discussing phenomena with illustrating pictures and diagrams. 5.Solve problem 6.Brain storming	• Midterm exams. • Final exam. • Homework. •Oral Questions. • Group output
2.2	Effectively communicates physics concepts, processes, and results, both orally and in writing related to nuclear physics		
3.0	**Values**		
3.1	Works responsibly and effectively within the work team to practice and interact with the principles and concepts of nuclear physics	1.Give students tasks of duties as a teamwork. 2.Asking the teamwork to write scientific reports or project. 3.Asking the teamwork to demonstrate the results of the scientific reports or project. 4. Interactive Drills	Evaluate: •the scientific reports, •the teamwork, •the efforts of each student in preparing the report. •Drill Assessment

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments, Quizzes and Homework	Weekly	10 %
2	Class Test Exam (Mid Tests)	5	20 %
3	Lab. Reports and Exam	Weekly	20 %
5	Final Exam	End of the term	50 %

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
4 office hours per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1. Krane,K.S., "Introductory Nuclear Physics", John Wiley and Sons Inc., India 2008. 2. Walter D. Loveland, David J. Morrissey, Glenn T. Seaborg. Modern Nuclear Chemistry. 2nd Ed. 2006 by John Wiley & Sons, Inc. Nuclear and Particle Physics B. R. Martin 2006 John Wiley & Sons, Ltd. ISBN: 0-470-01999-9
Essential References Materials	Richard Dunlap, An Introduction to the Physics of Nuclei and Particles
Electronic Materials	https://world-nuclear.org/ http://www.lnhb.fr/nuclear-data/nuclear-data-table/ https://www.nrc.gov/reading-rm/basic-ref/students/for-educators.html https://www.wins.org/

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room for 40 students, with data show. • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• (AV, data show, Smart Board, software, etc.) • data show + Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	(NO)

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	• Students • Classroom Observation • Professional Development Unit External Reviewers such as the ASIIN Accreditation Agency	• Student Surveys Formal Classroom Observation
Effectiveness of Assessment	• Curriculum and Test Development Unit • Curriculum Committee • Assessment Committee External Reviewers such as the ASIIN Accreditation Agency	• Item Analysis Data • Teacher Feedback • Student Feedback Course Reports

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of Achievement of Course Learning Outcomes	• Quality Assurance Unit Curriculum and Test Development Unit	• Item Analysis Data • Course Reports Annual Program Review

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	