هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Radiation Physics**
Course Code:	**2034202-4**
Program:	**Bachelor of Physics**
Department:	**Physics Department**
College:	**College of Science**
Institution:	**Taif University**
Version:	*Course Specification Version Number*
Last Revision Date:	**20-10-2023**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (4 h)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	Others
B.	☒ Required		☒ Elective		
3. Level/year at which this course is offered: (8th level /4th year)					
4. Course general Description:					
This course covers radioactivity (natural and manmade), nuclear radiation decay, interaction of radiation with matter, radiation detectors, radiation protection, effect of radiation on human, monitoring of radiation, and radiation doses.					
5. Pre-requirements for this course (if any):					
Nuclear Physics - 2034103-4					
6. Co-requisites for this course (if any):					
7. Course Main Objective(s):					
By the end of the course the student will be able to understand the principles of radiation and its interaction with matter with links to other industrial and medical applications. Course main objectives are as the following: ➢ Recognizing the natural radioactivity and cosmic rays and laws of decay. ➢ Inspect the various methods of interaction of radiation of radiation with matter. ➢ Recognizing the types and structure of various radiation detectors. ➢ Recognizing the concepts of ionizing radiation. ➢ Identify the effect of nuclear radiation on humans. ➢ Inspect various dosimeters and their use in radiation physics. ➢ Inspect various means of protection from ionizing radiation. ➢ Inspect Methods of calculation of radiation doses and the regulations of ICRP.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	6	100 %
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	45
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		90

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	Understand the structure of nuclear atom and nature of radiation			K4
1.2	Recognize types of radiation (natural and artificial), detectors, and dosimeters.			K3
1.3	Understanding the mechanisms describing radioactive decay and the production of ionizing radiation			K3
2.0	Skills			
2.1	Compare between the types of radiation.			S1
2.2	Calculating the half-life for radioactive sources and the activity of radioisotopes used in medical applications			S2
3.0	Values, autonomy, and responsibility			
3.1	Work efficiently within a teamwork frame to perform class and laboratory activities.			V2
3.2	Act responsibly and be able to prepare a written scientific report.			V2

C. Course Content

No	List of Topics	Contact Hours
1.	Basic concepts and structure of the atoms and nucleus: atomic models, and nuclear forces, radioisotopes, and fission fragments.	3
2.	Introduction to radiation, the nature & sources of radiation, and production of different types of radiation.	3
3.	Ionizing and non- Ionizing radiation: α, β, γ, P, n	3
4.	Radioactivity (natural and artificial), laws & unit of radioactivity, radioactive decay (α, β, γ), effective half-life, and biological half-life.	3
5.	Interaction of radiation with matter: interaction of charged particles (α, β) and non-charged particles with matter (γ, n).	3
6.	Attenuation of radiation (α, β, γ,) in matter, absorption law, Half Value Layer (HVL): the half-thickness, linear & mass attenuation coefficients	3
7.	Periodic Exam (1)	1
8.	Radiation detection and dosimetry: mechanism of radiation detection and quantification, types of radiation detectors, types of radiation dosimeters.	3
9.	Radiation measurement and units of radiation doses: exposure, absorbed dose, equivalent dose, effective dose, dose rate, and flux	3
10.	Biological effects of Ionizing radiation, radiation effect on human cells, deterministic effects, and stochastic effects	3
11.	Radiation protection principles; basic principles of protection, ALARA principles, radiation survey monitoring, lead aprons, and radiation protection in medicine.	3
12.	The system of radiological protection: Annual Dose Limits, contamination monitoring, nuclear waste, and ICRP recommendations,	3
13.	Industrial and medical uses of radiation and radioisotopes.	3
14.	Periodic Exam (2)	1
15.	Review	3
16.	Final Exam	3
Total		45
Part 2 (Laboratory)		
1.	Introduction to practical physics	2
2.	Background measurements	3
3.	Scintillation detectors	6
4.	Energy calibration	6

5.	Spectrum of Gamma rays	6
6.	Determine the energy of an unknown gamma-ray source	6
7.	Compton scattering	6
8.	Pair production and annihilation	6
9.	Energy resolution	6
10.	Half-life of $_{137}$Ba	6
11.	Reports evaluation	2
12.	Practical exam	2
Total		

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Periodic Exam (1)	Week 7	20 %
2.	Periodic Exam (2)	Week 14	10 %
3.	Activities	Periodically	10 %
4.	Final Practical Exam	Week 15	20 %
5.	Final Theoretical Exam	Week 16	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	Introductory Radiation Physics, S. Krane, Wiley, 3rd edition, 1987.
Supportive References	Radiation Protection, 4th edition, by: Jacob Shapiro, Harvard university press, Cambridge, England 2002 α, β & γ- ray Spectroscopy. Ed. by K. Siegbahn (North Holland Pub.co., Amsterdam, 1965) Vol.1.
Electronic Materials	
Other Learning Materials	Lecture notes and PowerPoint presentations

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Lecture room with max 60 seats Labs**
Technology equipment (projector, smart board, software)	**Data show, Smart Board, Laptop**
Other equipment (depending on the nature of the specialty)	**TU BlackBoard**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Pear reviewer Program coordinator Departmental council Faculty council**	**Indirect**
Effectiveness of students' assessment	**Students**	**Indirect**
Quality of learning resources	**Students Instructor Faculty**	**Indirect**
The extent to which CLOs have been achieved	**Program coordinator Instructor**	**Direct**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**PHYSICS DEPARTMENT COUNCIL**
REFERENCE NO.	**NO. 4-45**
DATE	**27/09/2023 (12/03/1445)**

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