



Jordan University of Science and Technology
Faculty of Engineering
Nuclear Engineering Department

NE311 Ionizing Radiation & Measurement - JNQF Level: 7

First Semester 2024-2025

Course Catalog

3 Credit Hours. Radiation Sources and their characteristics, review on interaction of radiation with matter, Statistical fluctuation and error propagation, Characteristics of various nuclear radiation detectors. Gas filled detectors, scintillation detectors, semiconductor diode detectors, neutron detection techniques

Teaching Method: On Campus

Text Book

Title	Radiation Detection and Measurement
Author(s)	Knoll, G. F.
Edition	4th Edition
Short Name	Ref #1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref #2	Physics and Engineering of Radiation Detection	Syed Naeem Ahmed	1st Edition	

Instructor

Name	Dr. GHADEER AL-MALKAWI
Office Location	E1L2
Office Hours	
Email	ghmalkawi@just.edu.jo

Class Schedule & Room

Section 1:

Lecture Time: Sun, Tue, Thu : 11:30 - 12:30

Room: LAB

Prerequisites

Line Number	Course Name	Prerequisite Type
2002060	NE206 Introduction To Nuclear Engineering	Prerequisite / Study
2002040	NE204 Applied Engineering Statistics	Prerequisite / Study

Tentative List of Topics Covered

Weeks	Topic	References
Weeks 1, 2	Radiation sources	
Weeks 3, 4	Interaction of radiation with matter	
Weeks 5, 6	General properties of radiation detectors	
Week 7	Modes of operation of detectors	
Week 8	Energy resolution, detection efficiency, dead time	
Weeks 9, 10, 11	General properties of gas filled detectors (ionization chambers, proportional counters and G-M counters)	
Week 12	General properties of scintillation detectors and applications	
Week 13	Semiconductor detectors	
Week 14	Neutron detection	
Week 15	Gamma spectroscopy	

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Students will be able to understand the mechanisms of radiation-material interaction with different types of radiation types and parameters. [1SO1] [1L7K1]	17%	
Students will be able to calculate the stopping power, ion range, exposure, and absorbed dose. [1SO1] [1L7S1]	17%	
Students will be able to describe the general properties of radiation detectors (efficiency, resolution, dead time...) [1SO2] [1L7S3]	24%	
Students will be able to describe how gas-filled detector functions. [1SO1] [1L7K1]	19%	
Students will be able to describe how the scintillation detector functions. [1SO1] [1L7K1]	8%	

Students will be able to describe how solid-state semi-conductor detector functions. [1SO1] [1L7K1]	10%	
Students will be able to describe how the neutrons can be detected [1SO1] [1L7K1]	5%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
76	24					

Relationship to NQF Outcomes (Out of 100%)		
L7K1	L7S1	L7S3
59	17	24

Evaluation	
Assessment Tool	Weight
First Exam	25%
Second Exam	25%
Homeworks & Quizzes	10%
Final Exam	40%

Policy	
Attendance	Since class discussion is a major course ingredient, regular attendance is mandatory. Attendance record will be taken into consideration in any borderline grade decisions.
Exam policy	There will be no make-up exams except in extreme circumstances at the discretion of the instructor. The instructor has to be informed in advance (by email, phone, personal ...). You will be asked to provide proper documentation.
Disabled Students	Students with any sort of limitation or disability should discuss its consequences with instructor prior to the start of the course.
Emergency Provisions	In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Here are ways to get information about changes in this course: - E-learning announcements - Instructor email (ghmalkawi@just.edu.jo)

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