

مختصر توصيف المقرر

(Course Information)

معلومات المقرر \*

الفيزياء الإشعاعية	اسم المقرر:
فيز 4842	رقم المقرر:
فيز 3812	اسم ورقم المتطلب السابق:
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السابع	مستوى المقرر:
3) 3+0+0(	الساعات المعتمدة:
Module Title:	Radiation Physics
Module ID:	PHYS 4842
Prerequisite (Co-requisite) :	PHYS 3812
Co-requisite :	--
Course Level:	Seventh
Credit Hours:	3 (3+0+0)

Module Description

وصف المقرر :

This course is designed leading to an understanding of radiation physics involved in diagnostic and therapeutic uses of radioactive isotopes and radiations. A survey course in safety from ionizing radiation. Topics covered include: properties of ionizing radiation; interaction of radiation with matter, detection methods, dosimetry, and biological effects of radiation. Definition of radiation quantities, doses and their units, instruments for measuring personal doses, radiation monitoring and radioactive contamination, biological effects of radiation, external and internal radiation exposure, radiation protection and shielding, recommendations of IAEA, protection against different radiations sources, decontamination, radioactive waste management.

Module Aims

أهداف المقرر :

In this course students are expected to learn about simple ideas of radiation physics.
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:Learning Outcomes:

مخرجات التعليم:

This course is designed leading to an understanding of radiation physics involved in diagnostic and therapeutic uses of radioactive isotopes and radiations. A survey course in safety from ionizing radiation. Topics covered include: properties of ionizing radiation; interaction of radiation with matter, detection methods, dosimetry, and biological effects of radiation. Definition of radiation quantities, doses and their units, instruments for measuring personal doses, radiation monitoring and radioactive contamination, biological effects of radiation, external and internal radiation exposure, radiation protection and shielding, recommendations of IAEA, protection against different radiations sources, decontamination, radioactive waste management.
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Course Contents:

محتوى المقرر:

ساعات التدريس (Hours)	عدد الأسابيع (Weeks)	قائمة الموضوعات (Subjects)
3	1	<p><b>I. Introduction</b></p> <p>a. Historical overview of: Ionizing radiation, Radiography, Fluoroscopy, Radioscopy</p> <p>b. Basic math review Exponents, Roots, Plane Geometry</p>
6	2	<p><b>II. Fundamental Properties of Matter</b></p> <p>a. Elements and atoms</p> <p>b. Molecules and compounds</p> <p>c. Subatomic particles Protons, Neutrons, Electrons</p> <p>d. Photons</p> <p>e. Atomic number vs. Z number</p>
3	1	<p><b>III. Radioactive Materials</b></p> <p>a. Isotope vs. Radioisotope</p> <p>b. Curie – the unit of activity</p> <p>c. Half-life of radioactive materials</p>
6	2	<p><b>IV. Types of Radiation</b></p> <p>a. Particulate radiation Alpha, Beta, Neutron</p> <p>b. Electromagnetic radiation X vs. Gamma, Production, Braking, Characteristic</p> <p>c. Monochromatic vs. wide spectrum</p>
12	4	<p><b>V. Interaction of Radiation with Matter</b></p> <p>a. Ionization</p> <p>b. Radiation interaction with matter Photoelectric effect, Compton scattering, Pair production</p> <p>c. Unit of radiation exposure – the roentgen</p> <p>d. Emissivity of commonly used radiographic sources</p> <p>e. Attenuation of electromagnetic radiation – shielding</p> <p>f. Emissivity of X-ray exposure devices</p> <p>g. Half-value layers; tenth value layers</p> <p>h. Inverse-square law</p>
6	2	<p><b>VI. Biological Effects of Radiation</b></p> <p>a. “Natural” background radiation</p> <p>b. Unit of radiation doze – rem</p> <p>c. Difference between radiation and contamination</p> <p>d. Allowable personnel exposure limits and banking concept</p>

		<ul style="list-style-type: none"> <li>e. Theory or allowable dose</li> <li>f. Radiation damage – repair concept</li> <li>g. Symptoms of radiation injury</li> <li>h. Acute radiation exposure and somatic injury</li> <li>i. Personnel monitoring for tracking exposure</li> <li>j. Organ radio-sensitivity</li> </ul>
6	2	<p>VII. Radiation Detection</p> <ul style="list-style-type: none"> <li>a. Pocket dosimeter</li> <li>b. Difference between dose and dose rate</li> <li>c. Survey instruments</li> </ul> <p>Geiger-Muller tube, Ionization chambers, Scintillation chambers, counters</p> <ul style="list-style-type: none"> <li>d. Film badge – radiation detector</li> <li>e. TLD's (Thermo-luminescent Dosimeters)</li> <li>f. Calibration</li> </ul>
6	2	<p>VIII. Exposure Devices and Radiation Sources</p> <ul style="list-style-type: none"> <li>a. Radioisotope sources</li> <li>b. Radioisotope exposure devices and characteristics</li> <li>c. Electronic radiation sources &lt; 450keV</li> </ul> <p>Generator, Tube design and fabrication, Control circuits, Accelerating potential, Target material and configuration, Heat dissipation, Duty Cycle, Beam filtration</p> <ul style="list-style-type: none"> <li>d. Electronic radiation sources &gt; 450keV</li> </ul> <p>Resonance transformer, Van de Graaff accelerator, Linac, Betatron, Output characteristics</p>

المقرر والمراجع المساندة:

Textbook and References:

سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم الكتاب المقرر Textbook title
(1987) ISBN-13: 978-0471805533	John Wiley and Sons	K.S. Krane	Introductory Nuclear Physics
سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم المرجع Reference
(2013) ISBN-13: 978-3527411764	Wiley-VCH	James E. Martin	Physics for Radiation Protection
(2010) ISBN-13: 978-3642008740	Springer	Podgoršak, Ervin B.	Radiation Physics for Medical Physicists