The Hashemite University
Faculty of Allied Health Sciences
Department of Medical Imaging
Course Syllabus

Course information	
Course Title	Principles of Radioactivity
Course Code	140508213
Prerequisites	140508111
Credit Hours	3(2+3) hours
Course Description	
This course introduces the undergraduate students to basics of radioactivity. This field of radioactivity expanded over the past decade. A knowledge of radiation dosimetry is essential for understanding computed radiography and CT scan.	
Course Objectives By the end of this course, student is expected to:	
1- Identify Half Life, Average Life and Effective Half Life 2- Discus several modes of radioactivity 3- Describe the mechanism of energy loss by EM radiation and particles 4- Explain the difference between gas detectors and solid state detectors	
Recommended Textbook	
Title	Introduction to Radiological Physics and Radiation Dosimetry
Author	Frank H. Attix
Publisher	Springer Dordrecht Heidelberg London New York
Year	1986
Edition	1st Ed
Book website	
Other References	
Title	The Essential Physics of Medical Imaging, 2nd Ed., 2002, By J.E. Busgberg, et al.
Author	Busgberg
Publisher	Elsevier Science
Year	2002
Edition	2nd Ed.

Course Contents

Chapter 1: RADIOACTIVITY

- Nature of Radiations
- History of Radioactivity
- Nuclear Stability
- Characteristic of Radioactive Disintegration
- Mathematical Expression of Disintegration Law
- Physical Half Life, Average Life and Effective Half Life
- Decay Constants (Total and Partial)
- Chain Decay
- Activity
- Units of Activity
- Specific Activity
- Production of Radionulides

Chapter 2: MODES OF RADIOACTIVE DECAY

- Alpha Decay
- Negative Beta Decay
- Positive Beta Decay
- Electron Capture Decay
- Gamma Decay
- Internal Conversion
- Radioactive Series
- Radioactive Equilibrium

Chapter 3: RADIATION DOSIMETRY

- Exposure, Exposure Rate and Unit of Exposure
- Kerma
- Absorbed Dose, Absorbed Dose Rate and Unit of Absorbed Dose
- Dose Equivalent, Quality Factor and Effective Dose
- Relation Between Exposure and Absorbed Dose (f-Factor)
- Linear Energy Transfer Process
- Relation between Energy Transfer and Energy Absorption
- Specific Gamma Ray Constant
- Dose Rate
- Measurement of Dose

Chapter 4: INTERACTION OF CHARGED PARTICLES WITH MATTER

1- INTERACTION OF ALPHA PARTICLES WITH MATTER

- Specific Ionization and W-Value
- Stopping Power
- Mean Range of Alpha Particles in Air
- Relative Range of Alpha Particles in Materials

2- INTERACTION OF BETA PARTICLES WITH MATTER

- Mechanism of Energy Loss by Electrons
- Specific Ionization
- Stopping Power of Electrons in Matter due to:
- Range of Beta Particles in Aluminum
- Absorption of Beta Particles
- Scattering of Beta Particles

Chapter 6: INTERACTION OF NEUTRONS WITH MATTER

- Neutron Kinetic Energy (Slow, Intermediate and Fast Neutrons)

- Neutron Sources
- Interaction of Neutrons with Tissue

Chapter 7: RADIATION DETECTION AND MEASUREMENT

- Properties of Dosimeters
- Types of Radiation Detectors

1- Gas Detectors
   - Basic Principles
   - Geiger-Muller Counters (Dead Time and Detector Efficiency)
   - Ionization Chambers
   - Proportional Counters

2- Solid State Detectors
   - Scintillation Detectors (NaI Crystal) and Photomultiplier Tube
   - Semiconductor Detectors

3- Liquid Detectors
   - Basic Principles
   - Scintillation Detectors

4- Personnel Dosimetry
   - Film Badges
   - Thermo luminescence Dosimeters (TLD)
   - Pocket Ionization Chamber

5- Portable Survey Meters.

Assessment	
First Exam	**20**
Second Exam	**20**
Final Exam	**40**
Lab + In course assessment	**20**