



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

<b>Course information</b>	
<b>Course Title</b>	Radiation Biology and Protection
<b>Course Code</b>	140508214
<b>Prerequisites</b>	140508111
<b>Credit Hours</b>	3

<b>Course Description</b>	
<ul style="list-style-type: none"> <li>• This course is mainly concerned with the following outlines:</li> <li>• Have basic information about the origin of natural background radiation and man-made radiation, the responsibility of the employer in a health care for maintain the ALARA concept in the workplace.</li> <li>• Have basic knowledge about the standards, actions, types of shielding, and the radiation monitoring apparatus in the field of radiation protection.</li> <li>• Introduce the student to the famous International and National radiation protection organizations, dose limits in various medical imaging clinical applications, how to follow the recommendations, and legislations of radiation protection.</li> <li>• Explain how the biological elements interact with ionizing radiation, what are the various possibilities and their risks on human life. Molecular and Cellular Response to Radiation.</li> </ul>	

<b>Course Objectives</b>	
By the end of this course, student is expected to:	
<ul style="list-style-type: none"> <li>• Understand the deterministic and stochastic effects of ionizing radiation on life</li> <li>• Understand how can the technologists reduce the radiation exposure to patients, staff and general public?</li> <li>• Acknowledge the type of detector can be used to measure the accumulated dose during daily exposures? and the different types of radiation survey monitors</li> <li>• Recognise how can radiographers limit the patient's exposure to ionizing radiation during a diagnostic x-ray procedure?</li> <li>• Acknowledge the design and layout of the shielding of radiology facilities for radiographic equipment, fluoroscopy, computed Tomography CT, and Nuclear Medicine Clinics.</li> </ul>	

<b>Recommended Textbook</b>	
Radiation Protection in Medical Radiography, 6 <sup>th</sup> Ed. By: M. A. Statkiewicz Sherer, P.J. Visconti and E. R. Ritenour. 2011. Published By: Mosby.	
Essentials of radiation biology and protection, 2nd Ed. By: S. Forshier. 2009. Published By: Delmar, NY.	

<b>Other References</b>	
Radiologic Science For Technologists, Physics, Biology and Radiation Protection, By: E. Seeram, 9 <sup>th</sup> Ed., 2008 Lippincott.	

<b>Websites</b>	
<b>Website</b>	<a href="http://www.icrp.org">http://www.icrp.org</a>
<b>Website</b>	<a href="http://www.unscear.org/">http://www.unscear.org/</a>
<b>Website</b>	<a href="http://www.rerf.jp/index_e.html">http://www.rerf.jp/index_e.html</a>
<b>Website</b>	<a href="http://www.icru.org/">http://www.icru.org/</a>

### Course Contents

#### SOURCES OF IONIZING RADIATION

- Sources of Radiation.
- Natural Background Ionizing Radiation sources.
- Man-Made (Artificial) Radiation sources.
- Attenuation of Ionizing Radiation (Interactions with Matter),

#### RADIATION QUANTITIES AND UNITS

- Radiation Exposure
- Radiation Dose:
  - Incident Dose, Surface Dose, Exit Dose, Image Receptor Dose.
  - Absorbed Dose, Equivalent and Effective Dose

#### RADIATION BIOLOGY

- Interaction of radiations with Tissues
- Molecular and Cellular Response to Radiation
- Organ Response to radiation
- Stochastic and Deterministic Effects.

#### PRINCIPLES OF RADIATION SAFETY

1- Justification, 2- Optimization, 3- Limitation

- Principles of Radiation Protection
  - Time, Distance, Shielding
- Classification of Work Areas

#### DOSE LIMITATION

- Radiation Protection Organizations
- Dose Limitation and Dose Limit.
- Recommended Dose Limits (ICRP – 1990 and 2003)

#### DESIGN AND LAYOUT OF DIAGNOSTIC RADIOLOGY EQUIPMENTS

- General Recommendations for the Design of a Radiology Room
- Design and Layout of Radiology Facilities

#### RADIATION SURVEY MONITORING

- Radiological Monitoring
- Types of Radiation Survey Monitors
  1. Personnel Dosimeters (PDs)
    - 1.1. Film Badges
    - 1.2. Thermo-luminescence Dosimeter (TLD)
    - 1.3. Optically Stimulated Luminescent Dosimeters (OSLD)
    - 1.4. Pocket Dosimeter (Pocket Ionization Chamber)
  2. Portable Radiation Survey Instruments
    - 2.1. Gas – Filled Counters (GM Counter, Ionization Chambers and Proportional Counter) Solid State Detectors

### Assessment

<b>First Exam</b>	20
<b>Second Exam</b>	20
<b>Final Exam</b>	40
<b>Lab + In course assessment</b>	20