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

Course information	
Course Title	Radiation Biology and Protection
Course Code	140508214
Prerequisites	140508111
Credit Hours	3

Course Description

- This course is mainly concerned with the following outlines:
- 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.
- Have basic knowledge about the standards, actions, types of shielding, and the radiation monitoring apparatus in the field of radiation protection.
- 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.
- 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.

Course Objectives

By the end of this course, student is expected to:

- Understand the deterministic and stochastic effects of ionizing radiation on life
- Understand how can the technologists reduce the radiation exposure to patients, staff and general public?
- Acknowledge the type of detector can be used to measure the accumulated dose during daily exposures? and the different types of radiation survey monitors
- Recognise how can radiographers limit the patient's exposure to ionizing radiation during a diagnostic x-ray procedure?
- Acknowledge the design and layout of the shielding of radiology facilities for radiographic equipment, fluoroscopy, computed Tomography CT, and Nuclear Medicine Clinics.

Recommended Textbook

Radiation Protection in Medical Radiography, 6th 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.

Other References

Radiologic Science For Technologists, Physics, Biology and Radiation Protection, By: E. Seeram, 9th Ed., 2008 Lippincott.

Websites	
Website	http://www.icrp.org
Website	http://www.unscear.org/
Website	http://www.rerf.jp/index_e.html
Website	http://www.icru.org/

Website	www.irpa.net

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