

Specialization	Radiologic Technology
Course Number	020810261
Course Title	Radiobiology and Radiation protection
Credit Hours	(3)
Theoretical Hours	(2)
Practical Hours	(3)

Brief Course Description:

- The course introduces the students into diagnostic radiology and nuclear medicine. It provides students with basic knowledge required to minimize excessive radiation exposure of patients, public and operators. Moreover, it deals with different types of radio sensitivity of various body organs, enabling students to know various radiation hazards and understanding the radiation units and the main differences between them.

Course Objectives:

Upon the completion of the course, the student will be able to:

1. Know and understand units & quantities of radiation and inter relationships between the various units of radiation.
2. Know the mechanism of radiation effect on various cells as a function of dose and area exposed.
3. Comprehend with the basic radiation protection philosophy and how to calculate the maximum permissible dose allowed to occupational and non – occupational persons.
4. Know how to describe the radiation method of operation of all types of detection & measuring instruments.
5. Understand the general protection methods for internal & external sources of radiation.
6. Apply practical skills related to theoretical material.

Unit number	Unit name	Unit content	Time needed
1	Review of interaction of x-ray with matter	<ul style="list-style-type: none"> • Objectives. • Interaction with matter. • Photoelectric effect. • Compton scattering. • Pair production. 	
2	Radiation quantities and units	<ul style="list-style-type: none"> • Radiation quantities. • Radiation units 	
3	Principles of Radiobiology	<ul style="list-style-type: none"> • Review of human biology. • Cell components. • Law of Bergonie. • Tissue radio sensitivity. • Physical factors affecting radio sensitivity 	
4	Biological factors affecting radio sensitivity	<ul style="list-style-type: none"> • Biological factors affect radio sensitivity. 	
5	Biological effects of ionizing radiation	<ul style="list-style-type: none"> • Objective. • Cell radiation exposure. • Direct hit theory. • Indirect hit theory. • Free radicals reactions. • Repair. • Cell sensitivity. • Dose response curves. • Whole body response. • Lethal dose. • Mechanism of Mammalian death. • Gastrointestinal death. • Central Nervous System Death. 	
6	Long term somatic effects of ionizing radiation	<ul style="list-style-type: none"> • Types of long-term somatic effects. 	
7	Biological effects of ionizing Radiation	<ul style="list-style-type: none"> • Basic DNA-RNA expression in levanter • Information Coding. • DNA – RNA gene expression. • DNA modification. • Dose effects. 	
8	Maximum Permissible dose (MPD)	<ul style="list-style-type: none"> • Basic radiation protection philosophy. • Categories of MPD. 	
9	Ionizing radiation detection instruments	<ul style="list-style-type: none"> • Types of instruments. • Personal monitoring devices. 	

		<ul style="list-style-type: none"> ● Field survey instruments ● Physics and instrumentation of other radiation detection instruments utilized in measurement of activity and exposure : <ul style="list-style-type: none"> ○ Dose calibrators ○ Gamma probes for sentinel node and other probe-guided surgery ○ Geiger-Mueller (GM) meters ○ Liquid scintillation counters ○ Survey meters ○ Thermo-luminescent dosimeters and other personnel monitors ○ Thyroid probes ○ Well counters 	
10	Basic Principles of radiation protection	<ul style="list-style-type: none"> ● Potential sources of radiation. <ul style="list-style-type: none"> ○ External. ○ Internal. ● Basic ways for protection from radiation. ● Half value layer. ● Methods to minimize diagnostic x-ray exposure to patients and operators: <ul style="list-style-type: none"> ○ Methods. ○ Proper collimation. ○ Gonadshield. ○ Proper filtration. ○ Optimum kV techniques. ○ High speed image receptor. ○ Proper dark room procedure ● Types of gonadshields. ● Use of gonadshields. ● Methods to minimize operator exposure. 	
11	Further reduction of operator exposure	<ul style="list-style-type: none"> ● Shield booth. ● Exposure Cord Length. ● Holding pats. ● Personal Monitoring. ● Special requirements for mobile machines. 	
12	Clinical competencies	<ul style="list-style-type: none"> ● Provided lead shielding for protection of gonads and other radiosensitive organs/tissues. ● Collimated properly for each view or projection to limit the amount of tissue exposed. 	

		<ul style="list-style-type: none"> • Provide radiation protection for patients and personnel by utilizing lead aprons, gloves, screens, collimation, patient restraints, filters, and employing correct technical factors to eliminate repeats. • Provide protection from possible electrical hazards by routinely inspecting electrical wiring. 	
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Teaching Methodology:

1. Lectures.
2. Discussion & Quizzes.
3. Homework.
4. Demonstrations & Seminars.

Text Books & References: References:

1. Radiation Protection in Medical Radiography 8th Edition , Authors: Mary Alice StatkiewiczSherer Paula Visconti E. Russell Ritenour Kelli Haynes, 2017
2. Workbook for Radiologic Science for Technologists 11th Edition- Physics, Biology, and Protection Authors: Stewart Bushong , 2016
3. Digital and Radiographic Imaging: A Practical Approach, Fourth Edition – 21 Dec 2004by Chris Gunn (Author).
4. Radiation Protection in Medical Radiography, 8th Edition- By Mary Alice StatkiewiczSherer, AS, RT(R), Paula J. Visconti, , E. Russell Ritenour, and Kelli Haynes, MSRS, RT(R)2018.