BCIT

Course Outline

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

Operating Unit: Health Sciences
Program: Medical Radiography
Option:

MRAD 3308
Radiobiology and Radiation Protection

Start Date: January, 2000 **End Date:** April, 2000

Course Credits: 3 **Term/Level:** 3

Total Hours: 24
Total Weeks: 8

Hours/Week: 3 **Lecture:** **Lab:** **Shop:** **Seminar:** **Other:**

Prerequisites

Course No.	Course Name
Anatomy and Physiology; Physics for Medical Radiography	

MRAD 3308 is a Prerequisite for:

Course No.	Course Name

Course Calendar Description

The first part of this course deals with the fundamental concepts of Radiobiology through a discussion of radiation interaction with tissue, radiosensitivity, and early and late effects of radiation.

In the second part of the course, Radiation Protection concepts are introduced. First, the principles of radiation protection and the establishment of dose limits are described. This is followed by a discussion of various methods used to minimize radiation dose to both patients and personnel. Finally, the course concludes with equipment specifications and shielding guides for diagnostic x-ray installations.

Course Goals

To provide students with a knowledge of radiation biology so that they can apply effective radiation protection measures to patients, personnel and members of the public; in meeting the entry to practice competencies of the CAMRT, for Radiation, Health and Safety in Radiology.

Evaluation

Final Examination	50%	A grade of 60% is required to pass this course.
Mid-Term	30%	
Projects	10%	
Quiz	10%	
TOTAL	100%	

Course Learning Outcomes/Competencies

Upon successful completion of this course the student will be able to:

1. define the term radiobiology and trace important historical events relating to the injury of humans exposed to radiation.
2. explain how radiation interacts with tissue with emphasis on photoelectric absorption and Compton effect.
3. explain two theories of biologic damage by radiation.
4. define the term "radiosensitivity" and state the law of Bergonie and Tribondeau.
5. describe the early effects of radiation.
6. describe the late effects of radiation, including; radiation effects on the embryo, fetus and child, based on the stages of development: pre-implantation, major organogenesis and growth stage.
7. describe stochastic and non-stochastic effects of low level radiation over an extended period of time with specific reference to radiology personnel.
8. explain the fundamental principles of radiation protection for diagnostic radiology; time, shielding and distance.
9. describe current radiation protection standards, including; the triad of justification, optimization (ALARA) and dose limitation as well as the triad of time, shielding, and distance.
10. state the dose limits for radiation workers and members of the public.
11. describe various methods for minimizing exposure of both patients and personnel to radiation.
12. identify equipment specifications for diagnostic radiology and explain how these specifications serve to protect patients and personnel from unnecessary radiation exposure.
13. explain the concept of radiation risk to the patient according to department radiation protection guidelines.

CAMRT COMPETENCIES

On successful completion of the above outcomes, you should be prepared to perform the following competencies as defined in the "Competency Profile" for radiographers, established by the CAMRT.

MODULE B/RADIATION HEALTH, AND SAFETY

CRITICAL TASK B1 Protect the patient

B1.1 Question female patients to ascertain possibility of pregnancy

B1.2 Consult with the radiologist or physician in cases of suspected pregnancy

B1.3 Adjust routine for radiography of pregnant women

B1.4 Provide information regarding radiation exposure to the fetus

B1.5 Use protective practices to reduce the risk of damaging effects of radiation in the diagnostic range

B1.6 Collimate only to the area of interest to minimize patient dose

B1.7 Select exposure factors consistent with optimal image quality and minimum radiation dose

B1.8 Use addition filters as required

B1.9 Monitor fluoroscopic exposure and note fluoroscopic time

CRITICAL TASK B2 Protect the technologist

B2.1 Stand behind protective barriers

B2.2 Wear lead protective apparel when remaining in the radiation area

B2.3 Remain as far as possible from patient and source during exposure

B2.4 Use position aids/immobilization devices to avoid having to hold the patient during the procedure

B2.5 Direct x-ray towards primary barriers only

CRITICAL TASK B3 Protect others required to be present during the procedure

B3.1 Advise accompanying females to leave the radiation area when pregnancy is known or suspected

B3.1 Instruct people in the radiation area to maintain a safe distance and/or use radiation barriers during the exposure

B3.3 Provide protection for people remaining with the patient during exposure

CRITICAL TASK B4 Protect others not required to be present during the procedure

B4.1 Close the doors of the radiation area when in use

B4.2 Instruct people to leave the vicinity during imaging procedure

CRITICAL TASK B5 Monitor personal radiation exposure

B5.1 Wear radiation monitoring device

B5.2 Check the accumulation of the radiation dose

B5.3 Take appropriate action should readings exceed recommended standards

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Course Content Verification

I verify that the content of this course outline is current, accurate, and complies with BCIT Policy.

M. Filipelli — Program Head/Chief Instructor

Dec 22/99 — Date

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

Instructor(s)

Euclid Seeram, RTR., B.Sc., M.Sc. Office No.: Office Phone:
Office Hrs.: E-mail Address:

Learning Resources

Required:

1. Safety Code - 20A: X-Ray Equipment in Medical Diagnosis, Part A, Health and Welfare Canada, 1990
2. Seeram, E.: Radiation Protection, Lippincott.1997

Recommended:

1. Radiologic Science for Technologists by Bushong, 6th Edition, C.V. Mosby, 1997.

BCIT Policy Information for Students

Assignment Details

To be discussed in class.

Week	Outcome/Material Covered	Week
AC	Predicted Order of Coverage	BD
Jan. 4	**Radiation Protection Overview** • Introduction • Essential Physics • Radiation Exposure	Jan. 17
Jan. 10	**Bioeffects of Radiation** • Definition of Radiobiology • Basic Concepts of Radiobiology	Jan. 24
Jan. 31	**Early Effects of Radiation** • Radiation Syndromes • Local Tissue Damage • Hematologic Effects • Cytogenetic Effects	Feb. 14
Feb. 7	**Late Effects of Radiation** • Epidemiologic Studies • Local Tissue Effects • Life-Span Shortening • Risk Estimates • Radiation-Induced Malignancy • Radiation and Pregnancy – Effects on Fertility – Irradiation in Utero – Genetic Effects	Feb. 21
Feb. 28	**MID-TERM EXAMINATION**	**Mar. 6**
	This exam is scheduled for the third hour of this week.	
Mar. 13	**SPRING BREAK**	**Mar. 13**
Mar. 20	**Current Standards of Radiation Protection** • Radiation Protection Concepts • Radiation Protection Organizations • Dose Limits	Mar. 20
Mar. 27	**Dose Reduction Methods** • Factors Affecting Dose • Guidelines and Recommendations • WCB of BC – Policy and Legislation	Apr. 10

Week	Outcome/Material Covered	Week
AC	Predicted Order of Coverage	BD
Apr. 3	**Dose Reduction Methods** • Guidelines and Recommendations • Shielding • Quality Control	Apr. 17
Apr. 24–28	FINAL EXAMINATION	Apr. 24–28
	The final examination is cumulative and is weighted on topics after the mid-term examination.	