BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

School of Health Sciences
Program: Medical Radiography
Option:

Course Outline Part A

MRAD 3308
Radiobiology and Radiation Protection

Hours/Week:	3	**Total Hours:**	24	**Term/Level:**	3
Lecture:		**Total Weeks:**	8	**Credits:**	1.5
Lab:					
Other:					

Prerequisites

Course No.	Course Name

Anatomy and Physiology; Physics for Medical Radiography

MRAD 3308 is a Prerequisite for:

Course No.	Course Name

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.

Course Description

The first part of this course deals with the fundamental concepts of Radiobiology through a discussion of radiation interaction with tissue, radiosensitivity, radiation effects at doses greater and within the diagnostic range, effects of radiation on the embryo and fetus as well as low-level radiation effects.

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.

Evaluation

Final Examination	40%	2 hours
Mid-Term	40%	1 hour
Projects	10%	
Quiz	10%	**You must achieve 60% to pass this course.**
TOTAL	100%	

Course Outcomes and Sub-Outcomes

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 radiation effects (stochastic and non-stochastic) for doses higher than the diagnostic range for the lymphoid organs, gonads, eyes, etc.
6. Describe radiation effects for doses within the diagnostic range for lymphoid organs, gonads, eyes, etc.
7. Describe radiation effects on the embryo, fetus and child, based on the stages of development: pre-implantation, major organogenesis and growth stage.
8. Describe stochastic and non-stochastic effects of low level radiation over an extended period of time with specific reference to radiology personnel.
9. Explain the fundamental principles of radiation protection for diagnostic radiology; time, shielding and distance.
10. Describe current radiation protection standards of justification, optimization (ALARA) and dose limitation for diagnostic radiology.
11. State the dose limits for radiation workers and members of the public.
12. Describe various methods for minimizing exposure of both patients and personnel to radiation.
13. Identify equipment specifications for diagnostic radiology and explain how these specifications serve to protect patients and personnel from unnecessary radiation exposure.
14. Explain the concept of radiation risk to the patient according to department radiation protection guidelines.

Course Record

Developed by: _____ Date: _____
Instructor Name and Department (signature)

Revised by: _____ Date: _____
Instructor Name and Department (signature)

Approved by: Ann McMillan Start Date: January 1996
Associate Dean / Program Head (signature)

Effective Date

January, 1997

Instructor(s)

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Text(s) and Equipment

Required:

1. Primer of Medical Radiobiology by Elizabeth Travis, 2nd Edition, Year Book Medical Publishers, 1989.
2. Safety Code - 20A: X-Ray Equipment in Medical Diagnosis, Part A, Health and Welfare Canada, 1990
3. Seeram, E.: Radiation Protection, Lippincott.1997

Recommended:

1. Current CAMRT Curriculum Guide.
2. Medical Radiation Biology by Pizzarello and Witcofski, 2nd Edition, Lea and Febiger, 1982.
3. Christensen's Physics of Diagnostic Radiology, 4th Edition, Lea and Febiger, 1990.
4. Radiologic Science for Technologists by Bushong, 5th Edition, C.V. Mosby, 1993.

Course Notes (Policies and Procedures)

Assignment Details

Project

- Search the literature for **one** article on either radiation biology or radiation protection.
- Summarize the article based on the format discussed in class.

Week Lecture or Lab Number	Outcome/Material Covered	Reference
AC		BD
Jan. 20 Jan. 27	• Introduction • Radiation Interaction with Tissue • Sensitivity of Various Organs of the Body • Bioeffects at Doses Higher than the Diagnostic Range	Jan. 6 Jan. 13
Feb. 17 Feb. 24	• Bioeffects at Doses within the Diagnostic Range • Effects of Radiation on Embryo, Fetus and Child • Low Level Radiation Effects • Principles of Radiation Protection	Feb. 3 Feb. 10
Feb.	MID TERM EXAMINATION	Mar.
Mar. 17	• Dose Limits • Minimizing Dose to Patients	Mar. 3
Mar. 10	SPRING BREAK	Mar. 10
Mar. 24	• Minimizing Dose to Personnel • Equipment Specifications	Mar. 31
Apr. 14	• Shielding Guides for Diagnostic X-ray Installation	Apr. 7
Apr. 21	FINAL EXAMINATION	Apr. 21