CAMOSUN COLLEGE	***School of Health & Human Services*** Medical Radiography Technology **Course Name: Radiobiology & Radiation Protection** **Course Number: MRAD 124**

COURSE OUTLINE

The Approved Course Description is available on the web:
http://camosun.ca/learn/calendar/current/web/mrad.html#MRAD124

Please note:

- *This outline will be electronically stored for five (5) years only. It is strongly recommended students keep this outline for your records.*
- *This course is only open to students in the Medical Radiography program.*

Introduction:

This online course will provide students with 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.

The first part of this course deals with a rationale for radiation protection and 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, the current standards for radiation protection 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. The course concludes with a discussion of the Canadian Radiation Protection Safety Code, Health Canada Safety Code (HCSC) 35, on topics defined by the CAMRT competencies and how they relate to the factors affecting dose to patients, personnel, and members of the public.

Finally, it is important to note that all radiation protection codes covered in this course will be those for Canada (HCSC 35: see reference listed in the Required Learning Resources of this course outline) and not for the United States as described in Bushong's textbook on radiologic science.

Students must achieve a minimum of a C+ (65%) to use this course as a prerequisite. Refer to the Camosun Calendar for detailed information about course prerequisites.

1. Instructor Information

(a)	Instructor:	Brent McMillen / Jemma Aubert		
(b)	Office Hours:	Email response and virtual office hours by appointment via Skype (or in person) available Monday – Friday 9:00 am to 5:00 pm.		
(c)	Location:	WT 212-D		
(d)	Phone:	250-370-3169	Skype ID:	Upon request
(e)	Email:	McMillenB@camosun.ca / AubertJ@camosun.ca		
(f)	Website:	http://online.camosun.ca/		

2. Intended Learning Outcomes/Competencies

The objectives of this course are linked with the CAMRT competencies which are indicated in brackets at the end of each statement.

Upon successful completion, the student will be able to:

1. Define the term radiobiology and trace important events relating to the injury of humans exposed to radiation. (C3.2)
2. Explain how radiation interacts with tissue. (C3.1)
3. Explain two theories of biologic damage by radiation. (C1.1, C3.2)
4. Define the term "radiosensitivity" and state the law of Bergonie and Tribondeau. (C1.1, C3.2)
5. Describe the early effects of radiation. (C3.2)
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. (C3.2)
7. Explain the fundamental principles of radiation protection for diagnostic radiology, and describe the quantities of radiation exposure and their respective units. (C1.5, C1.6, C2.4)
8. 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. (C1.1, C1.4)
9. State the dose limits for radiation workers and members of the public, and describe the guidelines for the reduction of gonadal dose, as outlined in HCSC 35. (C2.1, C2.3, C2.4)
10. Describe various methods for minimizing exposure of both patients and personnel to radiation, as outlined in SC 35. (C1, C2.1, C2.2, C2.3, C3.1)
11. Identify equipment requirements for diagnostic radiology, and explain how they serve to protect patients and personnel from unnecessary radiation exposure, as outlined in SC 35. (C1.4, C1.5, C1.6, C2.1, C2.3)
12. Explain the concept of Diagnostic Reference Levels (DRLs), as described in SC 35. (C2.3, C1.1)
13. Explain the parameters governing structural shielding requirements for radiography examinations, as outlined in SC 35. (C1.5, C1.6)
14. State the dose and image quality information needed by a physicist to establish baseline information for the radiology department, as outlined in SC 35. (C2.4, C3.3)
15. Explain the safety aspects of digital imaging systems that play a role in radiation protection, as outlined in HCSC 35. (C1.6, C2.1)
16. Outline the general procedures of a radiation protection survey and describe the essential elements of a Radiation Safety report, with respect to SC 35. (C2.2, C2.3, C2.4, C2.5)
17. Advocate radiation safety in terms of radiation risks, dose expectations of radiographic examinations, and consultation with medical radiation personnel as required. (C3.1, C3.3)
18. Describe the common types of radiation monitoring devices and their reporting mechanisms as related to legislation. (C2.2)

CAMRT Medical Radiography Competency Profile

3. Learning Resources

Required Textbooks:

Statkiewicz Sherer, M., Visconti. P. and Ritenour, E. (2014) *Radiation Protection in Medical Radiography*, 7th edition, Mosby

Other Required Resources:

Health Canada. (2009). *Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities*.

Optional Textbooks:

Bushong, S.C. (2013). *Radiologic Science for Technologists: Physics, Biology, and Protection* (10th ed.). Elsevier Health Sciences.

Desire-to-Learn (D2L):

D2L – the Camosun College online learning portal contains the remainder of the learning materials for this course. Students are expected to familiarize themselves with the online learning environment and all the features it has to make this course experience enriching. Log on at https://online.camosun.ca/ to access these materials.

D2L materials must not be considered your sole source of information! They merely summarize the main points and provide direction for your learning experiences. You may need to write down additional information from various sources. Additionally, not all details can be covered in the online content, and you will be required to refer to textbook material that is not discussed specifically in class.

Other Materials:

Additional resources may include, but are not limited to: online notes, multi-media and hyperlinks. You may prefer to download online notes ahead of time (when available) and then write your notes directly onto copies of the slides/content.

4. Student Assessment

Quizzes	25%
Assignments	15%
Midterm	25%
Final Exam	35%

Students must achieve a minimum of 65% to use this course as a prerequisite.

A mark of 65% must also be attained on the cumulative final exam to use this course as a prerequisite.

Assessment Details

Assessment		
Activity		**Weight**
Week 2	Module 1 quiz	2%
Week 2	Assignment 1	5%
Week 3	Module 2 and 3 quiz	5%
Week 4	Module 4 quiz	4%
Week 5	Module 5 quiz	4%
Week 6	**Midterm exam (modules 1-5)**	**25%**
Week 7	Module 6 quiz	5%
Week 8	Module 7 and 8 quiz	5%
Week 8	Assignment 2	10%
Week 9	**Final exam (modules 1-8)**	**35%**

- Unless otherwise stated, all assignments will be submitted via D2L and are due at midnight on the due date. If assignments are handed in late, students will incur a **5%/day** late penalty. It is mandatory that all assignments be submitted for course completion.

Quizzes and Final Exam:

- There is one Midterm exam worth 25% of total grade

- There is one cumulative Final exam worth 35% of total grade.

The final exam will be scheduled in conjunction with the clinical sites. It is a cumulative assay of the entire course. The final examination for this course will be during the week of May.11 – 15, 2015 on campus. Exam questions will be sequenced & randomized from a cumulative bank of test questions. **A mark of 65% must be attained on the cumulative final exam to use this course as a prerequisite.**

Exceptions due to emergency circumstances, such as health problems, or family crises require the approval of the instructor. Holidays or scheduled flights are not considered to be emergencies. The student may be required to provide verification of the emergency circumstance.

Assessment Details

In emergency circumstances, a student may write a quiz or final examination before or after the scheduled time if the student would otherwise be unable to complete the program or course.

Camosun Academic Policy retrievable from:
http://camosun.ca/learn/calendar/current/pdf/academic-policies.pdf)

Missed examinations cannot be made-up except in the case of documented illness (doctor's note).

5. Course Content and Schedule:

The following schedule is tentative and subject to change if deemed necessary by the instructor.

Date (M-F)	Week (term)	Week (course)	Course Activities	
			Modules and Reading	Assessment
Mar 16-20	11	1	**Getting Started** Chapter 1 Introduction Chapter 2 Radiation Types, Sources, and Doses Received	
Mar 23-27	12	2	**Module 1** Chapter 3 Interaction of X-Radiation with Matter Chapter 4 Radiation Quantities and Units sections in Ch.11/13 *(Optional: Chapter 1, 35)*	Module 1 quiz Assignment 1
Mar 30-Apr 3 **Apr 3 STAT**	13	3	**Module 2 and 3** Chapter 6 Overview of Cell Biology Chapter 7 Molecular and Cellular Radiation Biology *(Optional: Chapter 29, 30, 31, 32)*	Module 2 and 3 quiz
Apr 6-10 **Apr 6 STAT**	14	4	**Module 4** Chapter 8 Early Radiation Effects of Organ Systems *(Optional: Chapter 33, 34)*	Module 4 quiz
Apr 13-17	15	5	**Module 5** Chapter 9 Late Radiation Effects of Organ Systems	Module 5 quiz
Apr 20-24	16	6		**Midterm exam (modules 1-5)**
Apr 27-May 1	17	7	**Module 6** Chapter 5 Radiation Monitoring Chapter 13 Management of Personnel Radiation Dose Health Canada Safety Code 35 *(Optional: Chapter 38)*	Module 6 quiz

May 4-8	18	8	**Module 7 and 8** Chapter 12 Management of Patient Radiation Dose Health Canada Safety Code 35 *(Optional: Chapter 37)*	Module 7 and 8 quiz Assignment 2
May 11-15	19	9		**Final Exam (modules 1-8)**
May 18-22 **May 18 STAT**	20	10		

Midterm/Final Exam to be scheduled by each clinical site/Camosun

6. Grading System

The following two grading systems are used at Camosun College. This course will use:

[X] Standard Grading System (GPA)

[ ] Competency Based Grading System

1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+	Minimum level of achievement to use the course as a prerequisite.	3
60-64	C		2
50-59	D	Minimum level of achievement for which credit is granted.	1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress: A temporary grade assigned for courses that, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. (For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

CONDUCT POLICIES

It is the student's responsibility to become familiar with the content of these policies. The policies are available in each School Administration Office, Registration, and on the College web site in the Policy Section.

Academic Policies and Procedures
Student Conduct Policy

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College Calendar, Registrar's Office or the College web site at: Camosun.ca

MRT PROFESSIONAL CODE OF ETHICS

Camosun College Medical Radiography Technology students are expected to abide by the Canadian Association of Medical Radiation Technologist (CAMRT) Code of Ethics insomuch as it applies to them in the learning and clinical environments. This information is available on the CAMRT website at:CAMRT Code of Ethics

MRT Department Policies & Procedures

Camosun College Medical Radiography Technology students are responsible for knowing all of the MRT Department Policies and must abide by them, including dress codes & lab safety procedures.

http://camosun.ca/learn/programs/mrt/handbook.pdf

8. GENERAL

INFORMATION Suggested

Study Time/Study Habits

- Successful students should be prepared to work 2-4 hours per week studying the content for this course to achieve success. This is in addition to the time it takes to navigate the online content.
- You will be asked to find out information, to analyze the information, and make decisions based on your analysis. At the same time, you will have a lot of help available from the instructor and also your fellow students.
- You should work regularly with your peers in discussion forums and this should provide a rich learning environment with opportunities for interaction and connectedness.
- The instructor will be available during "virtual office" hours by appointment for students

needing additional support mastering the course content.

- Map out a homework schedule; include time for readings and discussion. You should complete course work and assignments on a weekly basis. Falling behind may impact your success.
- Study groups are a highly effective way of learning for many students.

The Medical Radiography Technology program is committed to promoting competence, professionalism and integrity in our students and developing their core skills to succeed throughout their academic programs and in their careers. The purpose of Academic Honesty Guidelines is to provide clear expectations of appropriate academic conduct and to establish processes for discipline in appropriate circumstances. It is the student's responsibility to become familiar with the content and the consequences of academic dishonesty. Before you begin your assignments, review the Academic Policies on the Camosun College website: http://camosun.ca/learn/becoming/policies.html

CAMOSUN COLLEGE

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