

 <p><b>CAMOSUN</b> COLLEGE</p>	<p style="text-align: center;"><b>School of Health &amp; Human Services</b> Medical Radiography Technology</p> <p><b>Course Name:        Radiographic Sciences</b></p> <p><b>Course Number:     MRAD 102</b></p>
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## COURSE OUTLINE

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**The Approved Course Description is available on the**

**web:** <http://camosun.ca/learn/calendar/current/web/mrad.html#MRAD102>

*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 course is designed to provide students with the knowledge needed to operate radiographic and accessory imaging equipment in the clinical environment. It covers the technical and physical principles affecting the radiographic image acquisition, processing, display and storage. The curriculum is based on digital imaging environments however film screen imaging (sensitometric curve) will be used as reference to enhance and build on key concepts.

Topics to include in-depth study of the structural design of a radiographic system's components (x-ray tube, table, bucky and generator). Also of importance are factors that influence the resultant image such as patient variables, technical exposure factors, beam geometry, equipment malfunction, display monitors, programmed image algorithms, and post acquisition processing tools. Random computed radiographic images will be used to discuss variables in quality and diagnostic parameters with respect to providing solutions based on technical, equipment, exposure technique or patient influence.

The imaging principles of fluoroscopic equipment used in the general imaging department as well as mobile C-arms will be covered. The design, construction, advantages and challenges of producing images with this type of equipment will be discussed in depth.

***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 Mekelburg		
(b)	Office Hours:	Wednesday and Thursday 1230 – 1320 or by appointment.		
(c)	Location:	MRT 212D		
(d)	Phone:	250-370-3992	Alternative Phone:	
(e)	Email:	<a href="mailto:mekelburgb@camosun.ca">mekelburgb@camosun.ca</a>		
(f)	Website:	<a href="http://online.camosun.ca/">http://online.camosun.ca/</a>		

## 2. Intended Learning Outcomes/Competencies

Letters and numbers following certain learning outcomes indicate the specific competencies covered from the CAMRT Medical Radiography Competency Profile:

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

1. Describe the components of a general x-ray room to include x-ray tube, generator, table, and bucky. (E1.1, E1.10)
2. Explain how each of the x-ray components interrelates to produce a diagnostic image. ( E1.1, E1.2, E1.3, E1.9, E1.10,)
3. Identify and provide possible solutions for CR, mobile, and fluoroscopy equipment malfunction. (A1.1, D2.1, D2.2,)
4. Describe the principles and major components of a computed radiography (CR) system to include computerized image processing, display, and storage. (E1.1, E1.9, E3.1, E3.2, E3.4)
5. Explain the influence of technical and non-technical factors on the resultant image such as: (E1.1, E1.9, E1.10, E1.12, E1.13, E2.1, E 2.3)
  - a. Patient
  - b. Exposure factors
  - c. Exposure distance
  - d. Density and contrast
  - e. Beam collimation
  - f. Beam geometry
  - g. Filtration (inherent and added)
  - h. Anti-scatter grids
  - i. Automatic Exposure Control (AEC)
  - j. Anatomical Programmed Response (APR)
6. Identify and provide solutions for loss of image quality. (A1.1, D2.1, D2.2, D2.6, E2.1, E2.3, E2.4)
7. Explain post processing tasks such as window level and width. (E2.4)
8. Summarize the sequence of steps and equipment involved from preparation for

image exposure to image storage. (E1.1, E1.2, E1.3, E1.4, E1.13)

9. Describe the technical components and architecture of fluoroscopic equipment. (D2.2, E1.2, E1.4)
10. Compare the advantages and challenges of using fluoroscopic based equipment. (E1.2, E1.4)
11. Identify radiographic accessory equipment and its role to produce diagnostic images. (D2.7)
12. Describe potential accessory equipment malfunction and its effect on the resultant image. (D2.7, D2.9)
13. Compare the use of a characteristic curve for computed radiography images versus film-screen images. (D1.1, D2.9, E1.11)

[CAMRT Medical Radiography Competency Profile](#)

### 3. Learning Resources

#### **Required Textbooks:**

Bushong, S.C. (2008). *Radiologic Science for Technologists: Physics, Biology, and Protection* (10th ed.). Elsevier Health Sciences.

#### **Optional Textbooks:**

Carter, C., & Vealé, B. (2009). *Digital Radiography and PACS*. Mosby Elsevier.  
Fauber (2013). *Radiographic Imaging and Exposure* (4th ed). Mosby Elsevier.

#### **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.

Additional resources may include, but are not limited to: lecture notes, PowerPoint slides, Laboratory Manuals, and hyperlinks. You may prefer to download lectures notes ahead of time (when available) and then write your notes directly onto copies of the slides.

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 in each lecture. Additionally, not all details can be covered in a lecture, and you will be required to refer to textbook material that is not discussed specifically in class.

#### 4. Student Assessment

Module Quizzes (3)	35%
Lab Exams (2)	30%
Cumulative Final Exam	35%
<b>TOTAL</b>	<b>100%</b>

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

#### Assessment Details

- There will be three major quizzes during the term to keep you up to date on course content. Quizzes are module assessments (i.e. not cumulative) and will be delivered at the beginning of designated Friday classes. The final lecture exam is cumulative including material covered in all modules, labs and assigned textbook readings.
- Two lab exams are meant to assess key concepts and applications learned in the lab experiments.
- In emergency circumstances, a student may write a test or final examination before or after the scheduled time if the student would otherwise be unable to complete the program or course. Exceptions due to emergency circumstances, such as unavoidable employment commitments, health problems, or unavoidable 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. Camosun Academic Policy retrievable from: <http://camosun.ca/learn/calendar/current/pdf/academic-policies.pdf>
- Missed quizzes or examinations cannot be made-up except in the case of documented illness (doctor's note).

NOTE: There will be weekly pre-lab quizzes that assess your understanding of each module or topic. These quizzes **need to be completed prior to your lab each week**. You must achieve 80% on these short quizzes to gain entry into the lab. You may retake the quiz as many times as you need to obtain the required percentage. These quizzes are to assess your understanding of each topic and prepare you for the lab experiments.

## 5. Course Content and Schedule:

### Lecture Days/Times & Room Number:

MRT 212C

Tuesday 09:30AM-10:20 AM and 10:30AM-11:20AM

Friday 10:30AM-11:20AM

### Lab Days/Times & Room Number:

XRAY LABS: 1 hour each week based on designated set

Tuesday 16:30-1720, or Wednesday 11:30-12:20, or 15:30-16:20, or 16:30-17:20

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

Week	Dates	Module	Lecture	Lab	Quizzes and Assignments
1	Sept. 3-6	1	Overview <ul style="list-style-type: none"> <li>History of x-rays</li> <li>X-ray Production</li> <li><b>X-ray Imaging systems</b></li> </ul> Equipment and clinical applications	X-ray room scavenger hunt	Lab practice pre-quiz, non-weighted activity  Lab pre-quiz #1- due Tuesday Sept 10th, 09:30am
2	Sept. 9-13	2	Digital Radiography CR and DR	1. Equipment orientation and exposures	Lab pre-quiz #2 due Tuesday Sept 17, 09:30am
3	Sept. 16-20	2 & 3	Flat panel Digital Radiography  Applied Dose and Image Quality	2. CR Orientation	Lab pre-quiz #3 due Tuesday Sept 24th, 09:30am
4	Sept. 23-27	3 & 4	Applied Dose and Image Quality  Exposure curves  Review for Quiz #1	3. Marker Lab	Lab pre quiz #4 due Tuesday Oct 1st, 09:30am
5	Sept. 30-Oct 4	5	Radiographic Principles <ul style="list-style-type: none"> <li>Patients</li> <li>Cassettes</li> </ul>	4. Image Noise	<b>Quiz #1, Friday Oct 4th</b>  Lab pre-quiz #5 due Tuesday Oct 8 <sup>th</sup> at 09:30 am.
6	Oct 7-11	5	Radiographic Principles	5.Cassette Size	Lab pre-quiz #6 due Tuesday Oct. 15 <sup>th</sup> , 09:30am.
7	Oct 15-18 (Thanksgiving)	5	Radiographic Principles	6. Compensating filters	Lab pre-quiz #7 due Tuesday, Oct 22, 09:30am.

Week	Dates	Module	Lecture	Lab	Quizzes and Assignments
8	Oct 21-25	5	Radiographic Principles Review for Lab Exam #1 and Quiz #2	7. Patient Attenuation	NO Lab pre-quiz
9	Oct 28-Nov 1	6	Scatter control Grids and grid errors	<b>Lab Exam #1</b>	Lab pre-quiz #8 due Tuesday, Nov 5 <sup>th</sup> , 09:30am.
10	Nov 4-8	7	Portable radiography	8. Inverse and Direct Square Law	<b>Quiz #2, Friday Nov. 8<sup>th</sup></b> Lab pre-quiz #9 due Tuesday, Nov 12th, 09:30am.
11	Nov 11-15 (Remembrance Day)	8	Fluoroscopy	9. Grid use	Lab pre-quiz #10 due Tuesday, Nov 19th, 09:30am.
12	Nov 18-22	9	Film Characteristic curve of film Review for Quiz #3	10. Grid errors	Lab pre-quiz #11 due Tuesday, Nov 26th, 09:30am.
13	Nov 25-29	9	Conventional radiography overview Comparison of characteristic curve for digital vs film	11.Sensitometric Curves	<b>Quiz #3, Friday Nov 29th</b>
14	Dec 2-6	Summary and Overview		<b>Lab Exam #2</b>	
15	Dec 9-13	<b>EXAM WEEK</b>			

*Exam Period Dec.9-13 (scheduled by registrar) - check CAMLINK.*

***Do not book trips until the final exam schedule is posted by the registrar.***

## 6. Grading System

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

- Standard Grading System (GPA)
- Competency Based Grading System

### 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](http://camosun.ca) for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete</i> : 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
IP	<i>In progress</i> : 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 3 <sup>rd</sup> course attempt or at the point of



<b>CW</b>	<i>Compulsory Withdrawal:</i> 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,
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## 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

<http://www.camosun.bc.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 inasmuch 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

Students are expected to attend all classes and labs. If you are unable to attend the lecture it is your responsibility to acquire all information given during a missed class including notes, hand-outs, assignments, changed examination dates, etc.

### Study Habits

Radiographic Sciences 102 will require regular study and preparation ahead of each class. It is valuable to review your notes within 24 hours following each class to help in retention of information. You should expect to spend 3-6 hours outside of scheduled class time in the preparation of assignments, answering on-line quizzes and for general studying. Study groups are a highly effective way of learning from 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>*



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