

CLASS SYLLABUS



COURSE TITLE: MRAD 159 – Principles of Imaging 2
CLASS SECTION: BX01A-BX01D
TERM: S2023
COURSE CREDITS: 3
DELIVERY METHOD(S): Synchronous

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.
Learn more about Camosun's [Territorial Acknowledgement](#).

<https://camosun.ca/about/covid-19-updates>

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.

INSTRUCTOR DETAILS

NAME: Dan Andrews
EMAIL: AndrewsD@camosun.ca
OFFICE: CHW 317
HOURS:

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

In this advanced-beginner course, students build on their knowledge of how to operate radiographic and accessory imaging equipment. Students explore fluoroscopy, mammography, mobile radiography, as well as intra-operative equipment. Students focus on the digital imaging process and digital archiving principles as they apply to a variety of radiographic imaging modalities. In the lab component of this course, students execute quality control tests and apply tolerance standards as outlined in federal safety codes to assess equipment performance.

Note: Only open to students in the Medical Radiography program.

PREREQUISITE(S): **All of:** C+ in MRAD 119
CO-REQUISITE(S): N/A
PRE/CO-REQUISITE(S): N/A

COURSE DELIVERY

ACTIVITY	HOURS / WEEK	# OF WEEKS	ACTIVITY HOURS
Lecture	3	15	
Seminar			
Lab / Collaborative Learning	2	15	
Supervised Field Practice			
Workplace Integrated Learning			
Online			
	TOTAL HOURS		75

COURSE LEARNING OUTCOMES

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

- a) describe the evolution, function, and importance of x-ray tubes used in a variety of medical imaging procedures.
- b) explain how diagnostic images are produced by describing the components and function of computed radiography, digital radiography, fluoroscopy, mobile radiography, mammography, and C-arms.
- c) describe how digital imaging principles and techniques are used in the performance of medical radiography.
- d) describe the use of digital archiving principles in the management of imaging data within a variety of workplace settings.
- e) apply the principles of quality control and quality assurance to review and analyze radiographic images for accuracy and quality.

COURSE OBJECTIVES AND MAPPED PROFESSIONAL COMPETENCIES

(also known as “sub-outcomes” or “learning objectives”)

Canadian Association of Medical Radiation Technologists Competency Profile, Radiological Technology (2019)

General Lecture Objectives

1. Describe the evolution, function, and importance of x-ray tubes used in a variety of medical imaging procedures.
2. Explain how diagnostic images are produced by describing the components and function of computed radiography, digital radiography, fluoroscopy, mobile radiography, mammography, and C-arms. **(RTR2.2, RTR2.4)**
3. explain the safety features and ensure radiation exposure is kept *as low as reasonably achievable (ALARA)* when operating a variety of radiographic systems, including computed radiography, digital radiography, fluoroscopy, mobile radiography, mammography, and C-arms. **(RTR1.4, RTR1.5, RTR2.6)**
4. Describe how digital imaging principles and techniques are used in the performance of medical radiography. **(RTR2.2, RTR2.4, RTR4.6, RTR6.1)**
5. Describe the use of digital archiving principles in the management of imaging data within a variety of workplace settings. **(RTR2.5)**
6. Apply the principles of quality control and quality assurance to review and analyze radiographic images for accuracy and quality. **(RTR2.7)**
7. critically appraise a scholarly article pertaining to a relevant topic related to radiographic equipment and emerging technologies in digital radiography **(6.3.3, RTR3.5)**

Quality Control Objectives: QC1-8 (RTR2.8)

QC1 Introduction to Quality Assurance (QA) and Quality Control (QC)

- 1.1 Define QA/QC as it pertains to a medical radiological facility
- 1.2 Identify CAMRT competencies pertaining to QA/QC
- 1.3 Describe the essential components of a QA/QC program within a clinical facility
- 1.4 Describe the purpose of [Health Canada Safety Code 35](#) (SC 35) and list the facility personnel roles and responsibilities
- 1.5 Describe the typical QA/QC-related duties of a Radiologic Technologist
- 1.6 State the regulatory requirements for medical X-ray equipment
- 1.7 Categorize QC procedures according to their frequency
- 1.8 Explain how statistical values are used in QC for radiographic systems

Read the following sections from Safety Code 35

Explanatory Notes

Introduction

Principle Objectives of the Safety Code

Section A: 1.0 Responsibilities of Personnel

Section B: 2.1 Regulatory Requirements and 2.2 Equipment Purchasing

QC2 Accuracy of Loading Factors

- 2.1 State the general requirements of radiographic equipment used in large medical facilities
- 2.2 Define the term loading factor as it pertains to radiographic equipment
- 2.3 Explain the functions of the: kVp selector, timer, AEC, and back-up timer
- 2.4 Describe the procedural steps involved in testing the accuracy of loading factors and state the SC 35 tolerance levels
- 2.5 Describe the procedural steps involved in determining proper functioning of the AEC in a digital system and state the tolerance level recommended by SC 35
- 2.6 Describe the possible causes of kVp inaccuracy

Read the following sections from Safety Code 35

Section B: 2.5.1 General Requirements #1-7

Section B: 2.5.2 Radiographic Equipment Requirements #3-7

QC3 Radiation Output

- 3.1 Explain the function of the mA selector
- 3.2 Define output linearity and reproducibility
- 3.3 Define mAs reciprocity
- 3.4 Describe the procedural steps involved in evaluating output linearity and reproducibility and state the SC 35 tolerance levels
- 3.5 Describe the possible causes of variation in radiation output

Read the following sections from Safety Code 35

Section B: 2.5.2 Radiographic Equipment Requirements #1-2

QC4 X-Ray Beam Filtration

- 4.1 Describe the function of the x-ray tube and label the components
- 4.2 Describe the purpose of the protective housing surrounding an x-ray tube
- 4.3 Describe how filtration affects the x-ray emission spectrum
- 4.4 Define half-value layer (HVL)

- 4.5 Interpret a graph depicting x-ray beam intensity as a function of thickness of absorber material to determine the HVL
- 4.6 Describe the steps involved in determining the adequacy of x-ray beam filtration and state the SC 35 tolerance levels (minimum HVL at each kVp)

Read the following sections from Safety Code 35

Section B: 2.5.1 General Requirements #8-9

QC5 Computed Radiography

- 5.1 Label the layers of the storage phosphor screen (SPS) used in a CR imaging plate (IP)
- 5.2 Describe the function of the CR reader and label the components
- 5.3 Describe the proper care and storage of IPs
- 5.4 Identify IPs that would no longer be suitable for clinical use due to damage or wear

Read the following sections from Safety Code 35*

Section B: 3.2.1 Computed Radiography Imaging Plates

Section B: 3.2.2 CR Cassette

*note: manufacturer recommendations for quality control of digital systems may supersede the safety code. The safety code acknowledges this.

QC6 Digital Image Quality – Part 1 (RTR6.1)

- 6.1 Define parameters used to characterize digital image quality, including spatial resolution, spatial frequency, dynamic range, and contrast resolution
- 6.2 Describe the tools that are used to assess digital image quality (e.g. SMPTE and TG18 QC test patterns)
- 6.3 Describe procedures for evaluating spatial resolution and contrast detectability of a digital radiographic system
- 6.4 Describe the procedure for assessing electronic display devices and the SC 35 requirements for devices used for technologist workstations and clinical interpretation
- 6.5 Describe the SC 35 QC requirements for spatial resolution and contrast detectability

Read the following sections from Safety Code 35*

Section B: 3.2.3 Electronic Display Devices

Section C: Daily QC Test D7, Monthly QC Test M6, and Annual QC Tests, Y15, Y16, and Y27

*note: manufacturer recommendations for quality control of digital systems may supersede the safety code. The safety code acknowledges this.

QC7 Digital Image Quality – Part 2 (RTR6.1, RTR6.6)

- 7.1 Define the following terms as they pertain to digital radiography: dynamic range, response function, exposure indicator (EI), noise, uniformity, and residual image
- 7.2 Compare and contrast FUJI Sensitivity number (S#) to GE Detector Exposure Index (DEI)
- 7.3 Describe the quality control procedures used to assess exposure indicator accuracy and reproducibility and state their frequency of testing as per SC 35
- 7.4 Explain how the digital imaging system determines the EI value and describe factors that affect the EI value
- 7.5 Describe the quality control procedures used to assess noise, uniformity, and artifacts and state their frequency of testing as per SC 35

Read the following sections from Safety Code 35*

Section C: Annual QC Tests, Y11-14, and Y17

*note: manufacturer recommendations for quality control of digital systems may supersede the safety code. The safety code acknowledges this.

QC8 Beam Alignment and Collimator (RTR1.9)

8.1 Describe the purpose of a beam limiting device

8.2 State the SC 35 requirement for beam limiting devices

8.3 Describe the quality control procedures for verifying alignment of the X-ray field to the light field and for ensuring proper functioning of the beam limiting device

Read the following sections from Safety Code 35

Section B: 2.5.2 Radiographic Equipment Requirements #8-9

Section C: 3.6 Annual QC Testing, Y8-9

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

[Bushong, S.C. (2021). Radiologic Science for Technologists: Physics, Biology, and Protection (12th ed.). Elsevier Health Sciences

Fauber, T. (2021). Radiographic Imaging & Exposure (6th ed.)

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

WEEK or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
1—May 1-5	Module 1 - Info Session	
2—May 8-12	Module 2 - Digital radiography and image processing	QC Lab 1
3—May 15-19	Module 3 - Information literacy	QC Lab 2
4—May 22-26	No class or lab Monday, May 22 (Victoria Day) Tue May 23 – Research Time for Seminar Articles	
5—May 29-June 2	Module 4 – Comparison of DR systems	QC Lab 3
6—June 5-9	Module 5 – Image quality, post-processing, and artifacts Seminar 1	QC Lab 4
7—June 12-16	Module 6 – PACS and imaging informatics Seminar 2	QC Lab 5
8—June 19-23	Work on RFP projects	
9—June 26-30	Module 7 – Digital fluoroscopy Seminar 3	QC Lab 6
10—July 3-7	No class or lab Monday, July 3 (Canada Day) Tue July 4 – Work on RFP projects	
11—July 10-14	Module 8 – Mobile radiography Seminar 4	QC Lab 7
12—July 17-21	Module 9 – Digital mammography & BMD Seminar 5	QC Lab 8

WEEK or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
13—July 24-28	Module 10 – Radiation safety and protection Seminar 6	
14—July 31-August 4	RFP Presentations July 31	
15—August 7--11	Stat Holiday August 7 (BC Day) Final Exam Period	

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced notice is required. Deadlines can be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

STUDENT EVALUATION

DESCRIPTION	WEIGHTING
Seminar Presentation	20%
Seminar Quizzes	10%
QC Labs	10%
QC Test	30%
RFP Group Project	30%
	TOTAL
	100%

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information. <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

Seminar

Students will host a seminar (in pairs) on a relevant topic. Students are encouraged to access a library session in the third week of class so that they can finalize their topic selection and identify relevant literature. By the end of the session, the pair will select an article to feature in their seminar and submit for approval by the instructor. Once the article has been approved, the pair will be asked to summarize key findings and develop 5 simple multiple choice questions based on the article content.

Seminar Quizzes

The quizzes will be based primarily on the seminar articles. The instructor will post a list of the articles on D2L so that everyone in the class can read the article before each seminar. The 5 multiple choice questions created by the presenters may be used in the quiz, subject to instructor editing/feedback. The instructor will create approximately 5 additional questions. The instructor may draw from prior program or course content, depending on the relevance to the seminar topic. The quizzes will be available online, may be attempted One (1) time and for a 10-minute window only.

QC Labs and Test

Students are responsible for participating in QC labs throughout the term and submitting their completed work to D2L. Students will receive credit for participating in each lab. Near the end of the course, there will be a written test on the content covered in the labs, which may draw from lecture material, lab exercises, and/or assigned readings.

RFP Project

Students will complete a group project and demonstrate their work in the form of a live presentation to their peers. It is expected that group members make themselves available to participate in group meetings and work on their project during the times allocated in the course schedule or agree to alternative meeting times. The instructor is available to provide guidance and assist students in finding resources for their presentation. More information about all of the assignments will be published on D2L.

COURSE GUIDELINES & EXPECTATIONS

TEST AND EXAMINATION PROCEDURES

There are policies regarding Teaching and Learning Practices for HHS Students, including written test and examination procedures including late arrivals and missed tests. Please see the Health and Human Services Student Handbook item 5.4 for Test and Examination Procedures.

(<https://legacy.camosun.ca/learn/school/health-human-services/student-info/index.html#teaching>)

Please, inform me as soon as possible if conditions have arisen to prevent you from taking your examination during the available times.

WRITTEN ASSIGNMENTS

Assignments are due before 2400 hours (midnight) on the assigned day unless otherwise specified.

Assignments about patients, residents or clients must be completed using the individual's initials only. Unless otherwise directed by individual course outlines or templates, assignments must be:

- word processed,
- double spaced,
- font meeting APA 7th edition guidelines,
- with a title page and a reference list.

Students requiring an extension for the due date of an assignment must negotiate with the instructor, at least 48 hours before the due date. Assignments submitted late *without* an approved extension will result in a **10% deduction** in marks for each day late, until the eve of the next assignment due date, or whenever the assignment no longer has value; whichever comes first. Abandoned/late assignments will NOT be accepted during the Flex weeks at the end of the semester.

SCHOOL OR DEPARTMENTAL INFORMATION

Health & Human Services Student Handbook: <http://camosun.ca/learn/school/health-human-services/student-info/index.html>

General Practicum Information: <http://camosun.ca/learn/school/health-human-services/student-info/practicum-info.html>

Allied Health & Technologies Department Handbooks:

- Certified Medical Laboratory Assistant: <http://camosun.ca/learn/school/health-human-services/student-info/program-info/cmla.html>

- Diagnostic Medical Sonography: <http://camosun.ca/learn/school/health-human-services/student-info/program-info/sono.html>
- Medical Radiography: <http://camosun.ca/learn/school/health-human-services/student-info/program-info/mrad.html>

Students enrolled in Allied Health & Technologies Programs must achieve a minimum of 65% or a “COM” in each of their courses in order to use their course as a pre-requisite and progress in their program.

Students enrolled in Allied Health & Technologies Programs must participate in learning activities that include intimate and direct personal contact with their classmates during supervised practice. Students are training to perform the duties of a healthcare professional. These duties usually require constant, close physical contact with patients and clients. Students may be required to simulate and perform these activities on one another during this course. Students may also be required to use special hygiene practices and protective gear to protect themselves from the transmission of communicable diseases (like COVID-19). Risks associated with learning and performing the physical duties of a healthcare profession cannot be entirely eliminated by any amount of caution or protection. Students who refuse, or are incapable of participating and performing these activities due to personal or medical limitations, may only continue to participate in their course work when supported by officially registered accommodations or temporary medical advisory.

STUDENT RESPONSIBILITY

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

SUPPORTS AND SERVICES FOR STUDENTS

Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Support Service	Website
Academic Advising	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling
Career Services	http://camosun.ca/coop
Financial Aid and Awards	http://camosun.ca/financialaid
Help Centres (Math/English/Science)	http://camosun.ca/help-centres
Indigenous Student Support	http://camosun.ca/indigenous
International Student Support	http://camosun.ca/international/
Learning Skills	http://camosun.ca/learningskills

Support Service	Website
Library	http://camosun.ca/services/library/
Office of Student Support	http://camosun.ca/oss
Ombudsperson	http://camosun.ca/ombuds
Registration	http://camosun.ca/registration
Technology Support	http://camosun.ca/its
Writing Centre	http://camosun.ca/writing-centre

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](#) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started: <http://camosun.ca/services/accessible-learning/>

Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

Course Withdrawals Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the “Attendance” section under “Registration Policies and Procedures” (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

Sexual Violence and Misconduct

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun’s Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student’s right to choose what is right for them. For more information see Camosun’s Sexualized Violence and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and camosun.ca/sexual-violence. To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-370-3841

Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College’s Student Misconduct Policy at <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College’s expectations of academic integrity and student behavioural conduct.

Changes to this Syllabus: Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.