

CLASS SYLLABUS



COURSE TITLE: AHLT 165 – Physics of Imaging & Therapy
CLASS SECTION: BX01
TERM: S2023
COURSE CREDITS: 3
DELIVERY METHOD(S): Synchronous

Camosun College campuses are located on the traditional territories of the Ləkʷəŋən 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: Chris Avis
EMAIL: AvisC@camosun.ca
OFFICE: Fisher 346 D (Lansdowne) / Tech 222 (Interurban)
HOURS: Monday: 12:30-1:00 (Online), Tuesday: 12:30-1:20 (Online), W, Th, F: 12:30-1:20 (Tech 222)

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 course, students examine the interactions of physical phenomena to understand the fundamental principles of radiation used for imaging and therapy. Students explore the differences between various imaging modalities such as sonography, conventional x-ray, computed tomography, nuclear imaging, and magnetic resonance imaging. Students experiment with theoretical knowledge during laboratory activities and examine the practical applications of medical imaging physics.

PREREQUISITE(S):

One of: C in Physics 12; C in PHYS 104 **OR One of:** C in Physics 11; C in PHYS 70; C in PHYS 101 **And one of:** C in Principles of Math 11; C in Pre-Calculus 11; C in MATH 073; C in MATH 137; C in MATH 139; C in MATH 173.

CO-REQUISITE(S): N/A

PRE/CO-REQUISITE(S): N/A

COURSE DELIVERY

ACTIVITY	HOURS / WEEK	# OF WEEKS	ACTIVITY HOURS
Lecture	4	15	
Seminar			
Lab / Collaborative Learning	2	15	
Supervised Field Practice			
Workplace Integrated Learning			
Online			
	TOTAL HOURS		90

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

- Scientific Calculator, Ruler
- Access to a computer with Microsoft Excel. Excel is available as part of the Office 365 Suite provided free to all Camosun students. See: <http://camosun.ca/services/its/other-services.html> for details.
- Access to a cellphone, camera or scanner capable of generating pdf documents for submission of homework and labs.

COURSE OBJECTIVES AND MAPPED PROFESSIONAL COMPETENCIES

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

Canadian Association of Medical Radiation Technologists:

1. solve problems and perform calculations with relevant equations for matter, electricity, magnetism, radiation, and waves using the correct units, measures, and notations. **(RTR.2.1)**
2. explain and apply the fundamental principles of matter, electricity, magnetism, radiation, and waves as they pertain to medical imaging and radiation therapy. **(RTR.2.1)**
3. compare and contrast the appropriate use of radiographic imaging, nuclear imaging, magnetic resonance imaging, and sonographic imaging as determined by physical and biologic effects. **(RTR.1.6, RTR.2.1, RTR.3.4, 4.5.1)**
4. describe the fundamental principles of radiation therapy as a treatment option for a variety of diseases. **(RTR.3.4)**

COURSE LEARNING OUTCOMES

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

- a) solve problems and perform calculations with relevant equations for matter, electricity, magnetism, radiation, and waves using the correct units, measures, and notations.
- b) explain and apply the fundamental principles of matter, electricity, magnetism, radiation, and waves as they pertain to medical imaging and radiation therapy.
- c) compare and contrast the appropriate use of radiographic imaging, nuclear imaging, magnetic resonance imaging, and sonographic imaging as determined by physical and biologic effects.
- d) describe the fundamental principles of radiation therapy as a treatment option for a variety of diseases.

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

Tuesday: 2:30 PM -4:20 PM, Online Zoom Lecture

Wednesday: 1:30 PM- 3:20 PM, CHW 347 Lecture

Thursday: 3:30 PM – 5:20 PM, CHW 233 Lecture

Friday: 1:30 PM – 3:20 PM, TECH 222 Lab

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

WEEK	ACTIVITY or TOPIC	DUE DATES
WEEK #1		
Monday, May 1 st	No lecture	
Tuesday, May 2 nd	Course Info, 1.1 Scientific Notation, 1.2 SI system, Unit Conversions	
Wednesday, May 3 rd	2.1 Wave Characteristics, 2.2 EM Waves	
Thursday, May 4 th	3.1 Periodic Table, Bohr Model, 3.2 Electron Energy Levels	
Friday, May 5 th	Lab 1- Balmer Series	Homework 1 (1.1 – 1.2)
WEEK #2		
Monday, May 8 th	No lecture	
Tuesday, May 9 th	4.1 Electric Charge, Coulomb's Law, 4.2 Electric Field and Field Lines, 4.3 Electric Potential Energy and Electric Potential	Homework 2 (2.1 – 3.2)
Wednesday, May 10 th	4.3 Electric Potential Energy and Electric Potential	
Thursday, May 11 th	4.4 Current and Ohm's Law, 4.5 Magnetism	Lab 1
Friday, May 12 th	Lab 2- Electric Field Mapping (with X-ray tube anode/cathode set up)	Homework 3 (4.1-4.2)
WEEK #3		
Monday, May 15 th	No lecture	
Tuesday, May 16 th	4.6 Electromagnetic Induction 5.1 Basic Circuitry of an X Ray Machine	Homework 4 (4.3-4.5)
Wednesday, May 17 th	5.2 X Ray Production Mechanisms, 5.3 X Ray Spectra,	
Thursday, May 18 th	6.1 Coherent and Compton Scatter, 6.2 The Photoelectric Effect, 6.3, 6.4 Pair Production, Photodisintegration, Summary of Attenuation Mechanisms	
Friday, May 19 th	Test #1 – Modules 1-4	
WEEK #4		
Monday, May 22 nd	College Closed	
Tuesday, May 23 rd	6.5 Attenuation of a Mono-energetic X-Ray Beam, 6.6 Heterogeneous Material and Sub Contrast	Homework 5 (4.6-5.2)
Wednesday, May 24 th	6.7 Attenuation of a Poly-energetic X Ray Beam, 6.8 Summary of Radiographic Imaging, 6.9 Intro to Computed Tomography	
Thursday, May 25 th	7.1 Atomic Notation and Nuclides, 7.2 Nuclear Stability and Binding Energy,	Lab 2
Friday, May 26 th	Lab 3- Simple Circuits and Ohm's Law (with new larger light bulbs, diodes)	Homework 6(5.2 – 6.4)
WEEK #5		
Monday, May 29 th	No Lecture	
Tuesday, May 30 th	7.3 Decay Processes	Homework 7 (6.5 – 6.9)
Wednesday, May 31 st	7.4 Interaction of Charged Particles with Matter, 7.5 Half Life and Activity	

WEEK	ACTIVITY or TOPIC	DUE DATES
Thursday, June 1 st	7.6 Radionuclide and Radiopharmaceutical Production, 7.7 Nuclear Imaging	Lab 3
Friday, June 2 nd	Lab 4- Attenuation of Radiation	Homework 8 (7.1 – 7.4)
WEEK #6		
Monday, June 5 th	No lecture	
Tuesday, June 6 th	8.1 Biological Effects of Radiation, 8.2 Radiation Dosimetry, 8.3 Radiation Therapy	
Wednesday, June 7 th	Test #2- Modules 5, 6, 7.1-7.4	
Thursday, June 8 th	9.1 Wave Interactions, 9.2 Sound Waves, 9.3 Physical Principles of Ultrasound Scans	Lab 4
Friday, June 9 th	Lab 5- Ultrasonic Waves	Homework 9 (7.5 – 8.3)
WEEK #7		
Monday, June 12 th	No lecture	
Tuesday, June 13 th	9.4 Physical Principles of Ultrasound Scans, Equipment and Other Considerations, 10.1 Physical Principles of Magnetic Resonance Imaging	Homework 10 (9.1 – 9.3)
Wednesday, June 14 th	10.2 MRI Equipment and Images, 10.3 Image Characteristics and Other Considerations	
Thursday, June 15 th	Exam Review	Lab 5
Friday, June 16 th	Final Exam	

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
Homework	35
Labs	20
Midterms (Friday, May 19 th and Wednesday, June 7 th)	25
Final Exam (Friday, June 16 th)	20
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>

COURSE GUIDELINES & EXPECTATIONS

- Course content, announcements, and important class information will be posted on d2L. Students must check d2L regularly.

- Homework assignments are available are d2L and are due on Tuesdays and Fridays according to the schedule.
- Students requiring an extension to labs or homework due to illness or other extenuating circumstances **must contact me prior** to the due dates. Otherwise, late penalties will apply as described below.
- For overdue labs or assignments, a late penalty of 10% per day will be assessed for the first five days following the due date. After this date a complete report is still required and earns a maximum mark of 50%.
- Two midterm tests will occur at the dates and times listed in the schedule. You will have 2 hours to complete each test. Tests will be written in person.
- Homework and Lab work must be submitted through the d2L Assignments tool. Questions or pages that are missing due to scanning errors will not be accepted at a later time.
- Any changes in due dates or timelines will be posted on the D2L calendar.
- There will be a two-hour, cumulative final exam written on the last day of class, in-person on campus.

PHYSICS DEPARTMENT GUIDELINES REGARDING TESTING AND GRADING:

- As stated in the current college calendar, “students are expected to write tests and final exams at the scheduled time and place.” Exceptions will only be considered due to emergency circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.
- Students must write quizzes, tests, midterm tests, etc., on the date and time assigned by the instructor. Missed exams normally receive a zero grade. Instructors are not required to provide make-up tests. At their discretion, instructors may waive a test in exceptional circumstances such as medical issues or a documented illness.

Any outstanding homework or labs must be submitted by the final exam and will be graded according to the late protocols outlined by the instructor.

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
Library	http://camosun.ca/services/library/

Support Service	Website
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.