CAMOSUN COLLEGE	***School of Health & Human Services*** Medical Radiography Technology **Course Name:** **Physics – Medical Radiography 2** **Course Number:** **MRAD 245**

COURSE OUTLINE

The Approved Course Description is available on the web:
http://camosun.ca/learn/calendar/current/web/mrad.html#MRAD245

Please note:

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

Introduction:

This is an introductory level course that emphasizes the application of physical phenomena in medical radiography. Topics include structure of matter, electromagnetic radiation, electrostatics, direct and alternating current circuits, magnetism and production of x-rays. The physics of x-ray tubes and the x-ray generator components, including heat dissipation, will also be discussed. Students will relate the production of radiation to a resultant radiographic image. Also discussed will be radiation exposure factors/setting and their direct effect on image diagnostic quality.

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:	Nicole Prent	Brent Mekelburg/Stephen Kapuvari
(b)	Office Hours:	TBA or by appointment	Wed 1230 – 1330 or by appointment
(c)	Location:	Fisher F308B	Wilna Thomas 212D
(d)	Phone:	250-370-3695	250-370-3992
(e)	Email:	prentN@camosun.bc.ca*	mekelburgB@camosun.bc.ca or kapuvariS@camosun.bc.ca
(f)	Website:	http://online.camosun.ca/	

* Contact via email is preferred over phone.

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. Solve mono-energetic x-ray attenuation problems using the attenuation equation and half value layers.
2. Calculate the subject contrast of an object based on attenuation calculations.
3. Describe the differences between mono-energetic and poly-energetic x-ray attenuation and the effect of beam hardening.
4. Compare the two main attenuation mechanisms with respect to their dominance and their effect on scatter and patient absorbed dose.
5. Describe and perform calculations relating to binary numbers.
6. Describe and perform calculations relating to the spatial resolution of an image, relating spatial resolution to pixel size, MTF.
7. Describe the effect of aliasing, and predict the presence of aliasing in an image based on the Nyquist theorem.
8. Describe and perform calculations relating to image noise, including Poisson statistics, signal to noise ratio, and detective quantum efficiency
9. Use and perform calculations related to contrast detail curves.
10. Describe and draw labeled diagrams for relevant topics relating to solid state physics. (E1.9, E1.10)
11. Describe and draw labeled diagrams relating to the structure and forces of the nucleus
12. Read information from a standard Chart of the Nuclides and perform calculations relating to the energetics of nuclear reactions and nuclear decay.
13. Describe and perform calculations relating to alpha decay.
14. Describe and perform calculations relating to the various modes of beta decay, including positron decay and electron capture.
15. Describe and perform calculations relating to gamma decay.
16. Understand and perform calculations relating to radioactive decay and half-life.
17. Explain the attenuation processes for alpha, beta, and gamma radiation and relate these processes to shielding requirements.
18. Perform quality control tests to demonstrate linearity, reproducibility, kV, half value layer, spatial resolution, CR dark noise and uniformity. (D1.1, D2.1, D2.2, D2.5, D2.6)

CAMRT Medical Radiography Competency Profile

3. Learning Resources

Required Textbooks:
MRAD 245 Coursepack

Other Materials: Scientific Calculator (to be brought to every class).

4. Student Assessment

Assignments / Tutorials	15 %
Physics Labs	10 %
X-Ray QC Labs	20 %
Mid Terms	25 %
Cumulative Final Exam	30 %
TOTAL	**100%**

Students must achieve a C+ (65%) to use this course as a prerequisite.

Assessment Details

Assignments are based on the problems in the MRAD 245 coursepack. The assignments will include problems for you to work on in class, as well as extra problems to do for homework. The assignment questions for a given week will cover all of the problems covered in sections up to the end of the day on the Wednesday of a particular week. These problems will then be due on the following Monday.

The class will be split into two lab groups and alternate between completing labs and short **tutorial assignments**. There will be two Physics labs (under the direction of N. Prent) and six X-Ray Quality Control Labs (under the direction of B. Mekelburg). Please refer to the attached schedule of labs at the end of this document for specific dates. Labs and tutorials must be handed in to the instructor within one week of the lab date.

Mid Term / Final Exam: There will be two midterm exams on Thursday, Feb. 5th and Monday, Mar. 5th. Problems on the midterm will be similar to those in the assignments and tutorials. The final exam will be cumulative, covering all content in the course and will take place in the final exam period.

Assessment Policies

Please note the following **very important course policies**.

1. In order to pass the course, students **must successfully complete <u>all</u>** labs and achieve an overall lab mark of 65%. Any student that does not meet this requirement **will be given an F** in the course, regardless of their performance in other aspects of the course.

2. Unless otherwise specified, labs and assignments will be due at the beginning of class on their respective due dates. Late labs / assignments will be subject to a 10 % per day late mark deduction, up to a maximum of 50%

3. Tests including the midterm and final exam must be written at the designated times

4. Exceptions to the above policies will be made only in the case of exceptional circumstances such as illnesses or medical emergencies. Should such eventualities arise, please contact the instructor as soon as possible and obtain documentation.

5. Course Content and Schedule:

Lecture Days/Times & Room Number:
Monday – Wednesday: 8:30 – 9:20 AM, Fisher 322

Lab & Tutorial Days/Times & Room Number:
Thursday: 8:30-10:20 AM, Fisher 322 or Wilna Thomas 212A (Lab /Tutorial assignments as announced)

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

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
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*
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,

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 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

- You will probably need to spend 6-8 hours outside of class per week reading and studying the content for this course to achieve full marks. Your instructor will be available during the scheduled "open lab" hours for students needing additional support mastering the course content.

Attendance

- You are expected to attend all classes, and be on time. It is your responsibility to keep up to date on *all* information given during a class missed, incl. notes, hand-outs, assignments, changed exam dates etc. Missed exams or quizzes cannot be made up except in case of documented illness (doctor's note required). ***Lab attendance is mandatory.***

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

MRAD 245 Lab Schedule

Date	Group A	Group B
January 8th	Review Tutorial (Fisher)	Review Tutorial (Fisher)
January 15th	Gamma Attenuation (Fisher)	Tutorial (Fisher)
January 22nd	Tutorial (Fisher)	Gamma Attenuation (Fisher)
January 29th	Gamma Attenuation Analysis (Wilna Thomas)	Gamma Attenuation Analysis (Wilna Thomas)
February 5th	Midterm #1	Midterm #1
February 12th	No Lab – Reading Week	No Lab – Reading Week
February 19th	Noise and Poisson Statistics (Fisher)	Tutorial (Fisher)
February 26th	Tutorial (Fisher)	Noise and Poisson Statistics (Fisher)
March 5th	Midterm #2	Midterm #2
March 12th	QC #1: CR Noise / Uniformity (Wilna Thomas)	Tutorial (Fisher)
March 19th	Tutorial (Fisher)	QC#1: CR Noise / Uniformity (Wilna Thomas)
March 26th	QC #2: Linearity (Wilna Thomas)	Tutorial (Fisher)
April 2nd	Tutorial (Fisher)	QC #2: Linearity (Wilna Thomas)
April 9th	Final Exam Review	
April 13th –April 16th	Final Exam	
April 20th – April 22nd	QC #3: Reproducibility (Wilna Thomas)	
April 27th - April 29th	QC #4: kV Accuracy (Wilna Thomas)	
May 4th - May 6th	QC #5: HVL Measurement (Wilna Thomas)	
May 11th – May 13th	QC #6: Spatial Resolution (Wilna Thomas)	