

Course Outline: 5208 Radiation Protection

Winter Term 2022: Classes begin Thursday, January 11th 2022;
Carleton winter break 22-25 Feb 2022.

Location and Time: Southam Hall 313 (when permitted in person)
Tuesdays, 4:00 – 7:00pm

For any portion of the course that is offered virtually, the instructor will send information with the class links directly to the students.

If pandemic restrictions permit, there may be 2-3 classes offered at The Ottawa Hospital later in the term which will include a hands-on lab component.

Instructor:

Lesley Buckley
Medical Physicist and Radiation Safety Officer
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Textbook: (recommended only) Introduction to Health Physics, 5th edition,
Thomas E Johnson. McGraw Hill, ISBN 978-0071835275

Lecture Dates (2018):

- | | |
|---------------------|--------------------------------------|
| 1. Jan 11 | 8. Mar 8 (Midterm?) |
| 2. Jan 18 | 9. Mar 15 |
| 3. Jan 25 | 10. Mar 22 |
| 4. Feb 1 | 11. Mar 29 |
| 5. Feb 8 | 12. Apr 5 |
| 6. Feb 15 | 13. Apr 12 |
| 7. Mar 1 (Midterm?) | Exam: week of April 18 th |

Marking scheme:

Project and Presentation:	15%
Assignments:	25%
Class discussions / preparation:	5%
Mid-Term exam:	20%
Final exam:	35%

Topics: (order of lectures is subject to change based on pandemic restrictions and class format)

Lecture 1: Basis for radiation protection. Overview of organizations. Whole body acute exposures, LD50, radiation death syndromes. ICRP103, risk-based approach, dose quantities, dose limits.

Lecture 2: Background radiation, radon. Biological mechanisms and risk of cancer induction by radiation. Secondary cancers from radiation exposure. Radiation risks to fetus.

Lecture 3: Shielding in radiation therapy, bunker design, safety systems in radiation therapy

Lecture 4: Isotope identification. Contamination monitoring. Environmental monitoring. Gamma and beta spectroscopy. Counting statistics.

Lecture 5: Overview of radiation detectors for radiation safety. Survey meters, proper survey techniques. Survey meter calibration.

Lab: radiation survey of radiation bunker, virtual or in-person

Lecture 6: CNSC licensing structure, philosophies. Comprehensive quality management. Provincial X-Ray regulatory structure. Overview of CNSC licence application process. Security of radioactive materials. Risk analysis. Incidents and accidents in radiation therapy part I.

Lecture 8: NEW designation, personnel monitoring, dose records. Permit systems. ALARA in the real world. Action levels, investigation levels. Pregnant NEWs.

Lecture 7: **Midterm exam.** Incidents and accidents in radiation protection part II.

Lecture 9: Nuclear substances in medicine. Cobalt teletherapy. HDR brachytherapy. Working with radioactive materials. Brachytherapy sources, leak testing. Waste handling.
(Virtual) tour of brachytherapy suite. Source calibration and handling demo.

Lecture 10: Shielding for X-ray facilities. Dose from CT. Diagnostic imaging and interventional procedures.

Demo: Tests of safety systems.

Lecture 11: Student presentations

Lecture 12: Class I nuclear facilities, industrial radiation protection, military applications of radiation protection.

Lecture 13: Radioactive patients, out-patient I-131. Dose from CT. Nuclear medicine departments. Dosimetry of internal emitters, MIRD

Project and Presentation:

Each student will complete a written report (5-10 pages) and make a class presentation (20 min) on a topic related to radiation protection. The details of the project and a list of suggested topics will be provided to the students at the second lecture. The topic should be discussed with the instructor prior to beginning work on the project. The presentations will be scheduled during the 11th week of lectures and the report will be due at that time.

Midterm and Final exams:

A midterm exam will be scheduled in-class on Mar 1st or Mar 8th, 2022. The midterm will be approximately 1.5 hours in duration and will cover material from lectures 1 through 6.

A final exam will be scheduled during the exam period in April and will cover material from the entire term. The final exam will be 3 hours in duration.

Inadequate Term Work:

In order to write the final exam, students must complete the Project and Presentation, and at least two assignments or the mid-term exam. Failure to complete the Project and Presentation, or the mid-term exam or two assignments, will result in the grade of “Fail – No Deferral (FND)”.

Academic Accommodation Policy

For more information about academic accommodation policies please visit the Equity Services website: www.carleton.ca/equity/accommodation. If you require academic accommodation you must contact the instructor during the first two weeks of classes or as soon as possible after the need for accommodation is known.

Academic Integrity Policy

Students should read and follow the Carleton University Academic Integrity Policy (<https://carleton.ca/secretariat/wp-content/uploads/Academic-Integrity-Policy-2021.pdf>). This policy is binding on all students and is strictly enforced. Students who violate the standards described in this policy may be subject to one of the following penalties: assignment of a Failure grade (F) for the course; academic probation; or suspension from all studies at Carleton and notation in your transcript of suspension for academic misconduct. Academic dishonesty in any form, including cheating on exams and copying assignment answers, will not be tolerated.

Policy Regarding Course Material

Assignments and exams created for this course remain the intellectual property of the instructor. They are intended for personal use and may not be reproduced or redistributed without prior written consent of the instructor.