

McGILL UNIVERSITY

MDPH 615 - PHYSICS OF NUCLEAR MEDICINE

Fall 2019

Instructors: **Shirin Abbasinejad Enger, Ph.D. (yellow boxes on course outline)**
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Time: Tuesday 9:00 – 11:00

Place: Room DS1.7001, Glen site, MUHC

Textbooks: S. Cherry, J. Sorenson, M. Phelps:
Physics in Nuclear Medicine
Saunders (2003)

E. B. Podgorsak:
Radiation Physics for Medical Physicists
Springer (2006)

Glen F. Knoll
Radiation detection and measurement

Lecture notes

Mid-term exam: **Tuesday, October 22, 2019, from 10:00 to 15:00**

Final Examination: **Date and time to be determined.**

Class outline:

Medical Physics: The physics of radioactivity and the applications of radioisotopes and radiopharmaceuticals in medical diagnosis. Topics covered include radiation spectrometry, the scintillation camera, image analysis and data processing in nuclear medicine, single photon emission tomography, and positron emission tomography.

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Learning Outcomes: By the end of this course, the student should be able to:

1. Be familiar with radionuclides used in nuclear imaging and therapy, production of these radionuclides and their dosimetry and be able to describe the radioactive decay.
 2. Describe the mechanism of action of organic and inorganic scintillators and the analog components of a scintillating counting system.
 3. Describe and understand the principles of the major imaging modalities in nuclear medicine, along with their advantages and limitations.
 4. Apply basic image reconstruction approaches to nuclear medicine imaging data.
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Assessment: There will be four assignments (consisting of problem sets, writing, programming, and/o readings), regular graded quizzes, a mid-term exam (in class), and a final exam (during the exam period).

Quizzes and Assignments (20%)

Mid-term exam (40%)

Final Exam (non-cumulative, 40%)

McGill Policies:

1) *McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/) for more information).*

2) *In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.*

NOTE: Under extreme circumstances, the contents of this document can be modified by the instructor to allow for adjustments in the course.

Health and Wellness Resources at McGill:

Student well-being is a priority for the University. All of our health and wellness resources have been integrated into a single Student Wellness Hub, your one-stop shop for everything related to your physical and mental health. If you need to access services or get more information, visit the Virtual Hub at mcgill.ca/wellness-hub or drop by the Brown Student Services Building (downtown) or Centennial Centre (Macdonald Campus). Within your faculty, you can also connect with your Local Wellness Advisor (to make an appointment, visit mcgill.ca/lwa).

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Course Outline

Lecture	Date	Lecture Title	Reading
1	2019/09/03	Introduction to Nuclear Medicine	Cherry, chap. 1 Dr. Enger's notes
2	2019/09/10	Modes of Radioactive Decay	Cherry, chap. 2 and 3 Dr. Enger's notes
3	2019/09/17	Decay of Radioactivity – Bateman Equation	Cherry, chap. 4 Dr. Enger's notes
4	2019/09/24	Radionuclide production	Cherry, chap. 5 Dr. Enger's notes
5	2019/10/01	Nuclear Radiation Measurements – Scintillation Counting Systems	Knoll, chap. 8 Cherry, chap. 7 & 8
6	2019/10/08	Nuclear Radiation Measurements – Pulse-Height Spectrometry	Cherry, chap. 10
7	2019/10/15	Internal radiation Dosimetry	Cherry, chap. 10 Dr. Enger's notes
	2019/10/22	Mid-term exam	
8	2019/10/29	Radiopharmaceuticals for Radiotherapy	
9	2019/11/05	Gamma camera – Basic Properties	Cherry, chap. 13
10	2019/11/12	Gamma camera – Performance Characteristics	Cherry, chap. 14
12	2019/11/19	Single Positron Emission Tomography (SPECT)	Cherry, chap. 17 & 19
13	2019/11/26	Positron Emission Tomography (PET)	Cherry, chap. 18 & 19
11	2019/12/03	Image Reconstruction in Nuclear Medicine	Cherry, chap. 15 & 16
	2019/12/09	Final exam	