Physics 432, Medical Physics Syllabus Spring 2025

Location: ELL 161, 2:30 - 3:50 pm, Tue, Fri

Date	Lec.	Assign		Торіс
Jan 07	1		Intro to radiotherapy	Radiotherapy workflow
Jan 10	2		Tour of BC Cancer Agency	2410 Lee Avenue, starting at 4pm, no class
Jan 14	3		Radioactivity	Atomic mass, nuclear decay, radioactivity, half-life, attenuation coefficients, uses in medical physics
Jan 17	4		X-ray and γ interactions	Photoelectric effect, Compton effect, pair production, interaction coefficients
Jan 21	5		Charged particle interactions	Electron and proton stopping power, bremsstrahlung production, LET, uses of charged particles
Jan 24	6	A1 due	Dosimetric quantities	Exposure and dose, charged particle equilibrium
Jan 28	7		Radiation generators, x-ray tubes	Theory, design, and operation
Jan 31	8		Linear accelerators and isotope devices	Design and operation, sources of RF, mechanical features, output spectra
Feb 04	9		Dosimetry instrumentation	Ionization chambers, TLD, diodes, film, chemical dosimetry, calorimetry, Bragg-Gray cavity theory
Feb 07	10	A2 due	Biological effects of ionizing radiation	Stochastic and non-stochastic effects, equivalent dose
Feb 11	11		Radiation protection and safety	Dose limits, exposure from natural and man-made sources, shielding
Feb 14	12		Radiation treatment planning	Dose calculations and distributions
Feb 25	13		Problem solving	Prepare for midterm
Feb 28	14		Midterm	
Mar 04	15		Computed tomography	System configuration and evolution, x-ray source, scintillation detectors, image reconstruction (Devon Richtsmeier)
Mar 07	16	A3 due	Nuclear medicine	Isotope production, radionuclide imaging using gamma camera, SPECT, PET: isotopes, detectors, sampling, random and true coincidences
Mar 11			No lecture	Magdalena traveling
Mar 14	17		Magnetic resonance imaging	NMR phenomenon, biological tissue discrimination, mapping of MR signals in 3-dimensions
Mar 18	18		Alternative radiation delivery methods (Zoom)	Proton therapy, gamma knife, CyberKnife, FLASH
Mar 21	19		Brachytherapy (Zoom)	Radioactive seeds. Methods of delivery. Application to prostate and cervical cancers.
Mar 25	20		Monte Carlo methods	Introduction to Monte Carlo simulations (Nathan Clements)
Mar 28	21	A4 due	Current Research Topics	Graduate students
Apr 01	22	Paper due	Student presentations 1	Undergraduate students
Apr 04	23		Student presentations 2	Undergraduate students

Instructor	Magdalena Bazalova-Carter	Elliott 109	<u>bazalova@uvic.ca</u>
ТА	Nathan Clements	Elliott 112	nclements@uvic.ca

Grading scheme

Assignments	20%
Paper	10%
Oral presentation	10%
Mid-term exam	20%
Final exam	40%
In-class bonus	5%

Paper should be a 2-page document (with references) on any medical physics related topic not directly covered in class or covered in much more detail than in class or (new this year) on an engineering project related to medical physics. You can discuss your topic selection with any instructor.

Some general paper instructions:

- 1) Do not use fake journals.
- 2) Use scientific/formal language, not colloquial language.
- 3) Always quantify values when possible.
- 4) Give examples.
- 5) Figures are encouraged to help explain concepts.

Project (might be interesting for engineering students) should be a design of a device useful for medical physics. It can be anything from a holder for an ionization chamber to a 3D-printed human.

Oral presentation will be 12 minutes long (10 minute presentation + minute questions) on the same topic. Figures are preferred over slides with just text.

Office hours: Fridays 1-2pm. If needed and reasonable, email the instructor and arrange for another time.

Grading schemes for papers and oral presentations are listed on Brightspace and will be discussed in class.

Textbook and other information can be found at <u>http://web.uvic.ca/~bazalova/teaching.html</u>.