PHYS332: Introduction to Biomedical Physics
**Spring 2026**

Professor: Dr. Devika Chithrani
Office: Elliot 107
Office Hours: TBA or by appointment
https://web.uvic.ca/~devikac/

**Abstract**
This course will introduce you to basic concepts of biomedical physics. For example, you learned properties of photons, electrons and atoms in your first-year physics courses (PHYS 110/111; PHYS 120/130; PHYS102A/102B). In this course, we will learn how we can use photons, electrons, and atoms in biomedical medical applications.

**The main topics**: Interactions of photons with matter; Radioactivity; Radiotherapy; Medical imaging.

**Assignments:**
There will be 4 assignments.

**Labs:**
No labs.

**Marking Scheme**
–Assignments 20%
–Midterm exam 20%
–Final exam 40%
–Presentation on a selected biomedical topic (15-minute duration) 10%
–Scientific report on the selected biomedical topic (5 pages) 10%

**Selected topics for the presentation and report**
Students will be provided with a list of topics relevant to the course materials with more emphasis on application side. Students can also suggest a topic as well. The topic selected will be used for the presentation and the report. Report will be 5 pages and presentation is 15 minutes long. Guidance to write the report will be provided.

**Necessary reading materials** will be provided for free. Lecture notes will be provided as well.
Will arrange a tour to BC Cancer to see how therapy and imaging done.

**Calculators**
Non-programmable calculators are allowed.

**Topics**

1. Interactions of photons with matter
a) The photoelectric effect.
b) Light emitted as photons: X-ray production
c) Application of X-rays
d) Light scattered as photons: Compton scattering and pair production probability

2. Particles Behaving as Waves
a) Introduction
b) Electron waves and the Bohr model of hydrogen
c) Hydrogen energy levels in the Bohr model
d) Nuclear motion and the reduced mass of an atom
e) The laser: Spontaneous and stimulated emission
f) Continuous spectra; blackbody radiation
g) Plank and the quantum hypothesis
h) The Heisenberg uncertainty principle for matter
i) The limits of the Bohr model

3. Nuclear Physics and Radioactivity
a) Structure and Properties of the Nucleus
b) Binding Energy and Nuclear Forces
c) Radioactivity
d) Alpha Decay
e) Beta Decay
f) Gamma Decay

4. Interactions of ionizing radiation with matter
a) Introduction
b) Attenuation and cross section
c) X-rays and Gamma radiation
d) Particles
e) Detection of ionizing radiation

5. Biological effects of ionizing radiation
a) Introduction
b) Measurement of Radiation – Dosimetry
c) Radiation Therapy
d) Mechanism of cell damage
e) Dose and dose equivalent
f) Types of effect
g) Medical effects and risks
h) Ultraviolet radiation

6. Medical imaging
a) Introduction
b) X-ray/CT imaging
d) PET/SPECT imaging
f) MRI imaging