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 medical applications such as radiation therapy and imaging.


There will be a tour to one of medical research laboratories and BC cancer agency towards the end of the course.

Assignments:
There will be bi-weekly assignments.

Labs:
No labs.

Marking Scheme

–Assignments 15%
–Midterm exam 25%
–Final exam 35%
–Presentation on a selected biomedical topic 10%
–Scientific report on the selected biomedical topic (5 pages) 10%
–Attendance 5%

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. The topic selected will be used for the presentation and the report. Report will be 5 pages and presentation is 10 minutes long. Guidance to write the report will be provided.
Course pack is available at the book store and the front page descriptions is as follows:
PHYS 280 A01
Introduction to Biomedical Physics
Course readings
Devika Chithrani”.

Calculators
On all examinations the only acceptable calculator is the Sharp EL-510RNB which can be purchased from the bookstore.

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 imaging
   c) CT scan
   d) PET scan
   e) Gamma camera and SPECT
   f) Magnetism and MRI