PAM1014

Introduction to Radiation Physics

Introduction

- Course content
- Laboratory Exercise
- Coursework Assignments
- Exams

Module Description

http://newton.ex.ac.uk/teaching/modules/PAM1014.html

Aims

- Develop essential mathematical skills
- Gain knowledge of the essential science underpinning the various radiation imaging modalities.
- Provide introductory knowledge of radiation biology and physics
- The legislative framework is introduced: justification, optimisation and limitation in control of ionising radiations.

Module Specific Skills

- describe matter at the atomic level;
- represent the electromagnetic spectrum at an essential level;
- describe key features of atomic spectra and interactions of photons with matter;
- explain the scope of applications of ionising radiation in medicine;
- describe how radiation imparts damage to tissue and how the energy imparted is quantified;
- describe the legislative framework and local rules for safe working with ionising radiation;
- describe basic features of DC circuits;

Lectures

- 14 x 50 mins
  - Start: 5 past the hour
  - Finish: 5 to the hour
- Handouts
- Questions
- Attendance
- Background Reading

Laboratory Exercise

- Total of 4 lab exercises to be completed over TWO 3 hour sessions
- Weeks 4 and 5
- Completed worksheets to be handed in to school office by Friday week 10
- Counts towards 10% final mark

Coursework Assignments

- FIVE individual effort assignments
- Assigned Monday (weeks 4, 5, 6, 8 & 9)
- To be handed in to the school office 3pm Friday
- Counts 50% towards final mark

In-Class Tests

- TWO 30 minute exams
- Weeks 7 and 10
- Counts 40% towards final mark

The Honour Code

- All individual effort works are meant to be done individually
- Cheating and plagiarism in any form or format is not acceptable
- Any betrayal of the Honour Code will be harshly dealt with, including expulsion

Syllabus Plan and Content

- Mathematical skills
  - Numbers, physical quantities, symbols and units.
  - Operations: fractions; powers, roots, reciprocals.
  - Areas and volumes: standard shapes and solids.
  - Equations: simplifying, rearranging and solving.
  - Graphs and functions, cartesian and polar coordinates, 2D and 3D.
- FLAP (Flexible Learning Approach to Physics)

Syllabus Plan and Content

- Physics concepts
  - Molecules, atoms, nuclei, electrons, ions.
  - Size of atoms, atomic mass, isotopes.
  - Electromagnetic spectrum, photons.
  - X-ray production: Bremsstrahlung and characteristic radiation
  - Radioactive decay: alpha- , beta-, and gamma-decay.
  - DC circuits: current, voltage, resistance, energy and power.
  - Overview of digital electronics: bits and ADC.

Syllabus Plan and Content

- Radiation, radiation protection and dosimetry
  - Overview of ionising radiation in diagnosis and therapy.
  - X-ray interaction: Rayleigh scattering, photoelectric effect, Compton scattering, and pair production.
  - Basic radiobiology.
  - Radiation dose, radiation units.
  - Dosimetry: practical devices, including personnel monitoring.
  - Overview of legislation and regulations for radiation protection:

Maths Support

- FLAP pack
- Flexible Learning Approach to Physics
- Supplementary maths classes with Dr Jory

FLAP – Support Program

Room 124 – Mondays at 4pm

- Week 2: M1.1
- Week 3: M1.2
- Week 4: M1.3
- Week 5: M1.4
- Week 6: M1.5
- Week 7: M1.6
- Weeks 8 -10: General Help/Revision