PAM2011
Science for Medical Image: Introduction

In This Lecture:

- Aims of this module
- Prerequisites
- Teaching Methods
- Assessment
- Syllabus
- Science for Medical Imaging

Aims

To develop a range of basic mathematical skills and knowledge of the essential science which underpins the various imaging modalities.

To provide sufficient knowledge of introductory radiation biology and physics to allow students an appreciation of safe and optimal use of radiation imaging techniques.

Intended Learning Outcomes

- **Module Specific Skills**
  - Produce graphs of functional variations;
  - Analyse simple oscillatory motion, relating this to electromagnetic and particulate phenomenon pertinent to medical imaging;
  - Construct schematic circuits and explain magnetic fields, beginning with charge distributions and motion;
  - Use concepts in radiation dosimetry to perform dose calculations;
  - Discuss the biological effects of radiation at both whole body and cellular/molecular level;

Intended Learning Outcomes

- **Discipline Specific Skills**
  - Display mathematical skills sufficient to support Stage-two work;
  - Use appropriate sources of information to develop own knowledge;

- **Personal and Key Skills**
  - Manage time and, with some guidance, prioritise workloads;
  - Use problem-solving skills in practical situations.

Prerequisites

- PAM1004 (Science Background 1)
- GCSE mathematics
  - Manipulating equations
  - Graph plotting
  - Exponential and logarithmic equations

- Determination

Syllabus

I.   Mathematical Skills

II. Vibrations and Waves

III. Electricity and Magnetism

IV. The Effects of Radiation on Human Tissue

Teaching

- Lectures
  - 21 X 50min lectures
  - Handouts supplied for lecture
  - Beware - Not complete!
- Lab Classes
  - 3 X 3hour laboratory classes
  - Semester 2

Assessment

Weeks 7 and 10
Two 45-minute tests (40%)

Semester 2
Nine hours of practical work (10%)
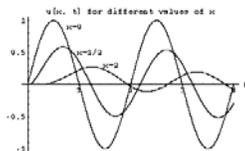
Semester 2
One 90-minute exam (50%)

Example Questions

- Each lecture ends with a set of example questions

- Answers can will be posted on WebCT

Mathematical Skills

- Need to support the science
  - Exponential Function
  - Logarithmic Functions
  - Trigometirc Functions
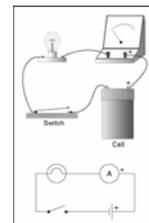- Graph plotting Skills
  - Lab Classes
  - Project Studies

Electricity

- Static Charge

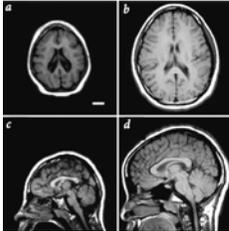- Electric Circuits

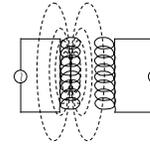- Digital Electronics

Magnetism

<u>N</u>uclear <u>M</u>agnetic <u>R</u>esonance (NMR)

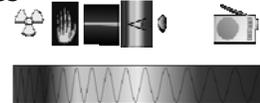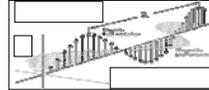MRI (Magnetic Resonance Imaging)

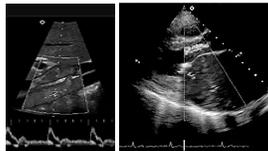## Electromagnetism

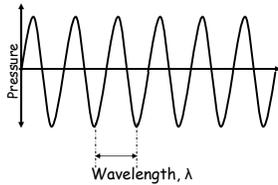- Interaction between Electricity & Magnetism

- Electrometric Waves

Waves and Oscillations

- Ultrasound

Pressure

Wavelength, λ

Effects of Radiation on Tissue

- Radiobiology

- Whole Body, Cellular & Molecular Level

DANGER
Radiation risk