Engineering Tripos Part IIB, 4I8: Medical Physics, 2020-21

Module Leader

Dr G Treece [1]

Lecturer

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Timing and Structure

Lent Term. Assessment: 100% exam

Prerequisites

3G4 useful

Aims

The aims of the course are to:

- Describe the importance of physics in medicine
- Understand the general principles of medical image reconstruction and registration
- Compare and contrast the medical imaging techniques that are available in a hospital setting and explain their relative merits
- Explain the difference between imaging with ionising and non-ionising radiation in the context of radiation dosimetry and risk
- Describe sensing and therapeutic applications of physics in medicine

Content

The material should be accessible to all Part IIA Bioengineering and Part III Physics students. The course was revised for the 2017-2018 academic year, including more extensive handouts and more in depth coverage of the core underlying material. The lectures include some guest lecturers who are medical physicists invited from Addenbrooke’s to give a flavour of the clinical career options in the discipline.

Introduction

Historical background; radiation interactions; general imaging concepts; and contrast mechanisms.

Medical Imaging Methodology

For all clinically applicable imaging techniques, a detailed description of contrast mechanisms, data acquisition hardware and image reconstruction will be provided. This will cover: imaging with ionising radiation, including X-ray, CT, nuclear medicine, SPECT and PET; imaging with non-ionising radiation, including MRI and ultrasound; and general principles of image reconstruction and registration of images over time and between modalities.

Clinical Applications of Physics
Clinical examples of the utility of medical imaging in diagnosis and treatment of disease. Sensing applications of physics in hospitals, including patient monitoring. Therapeutic applications of physics, particularly radiotherapy in cancer patients.

**Booklists**

Please refer to the Booklist for Part IIB Courses for references to this module, this can be found on the associated Moodle course.

**Examination Guidelines**

Please refer to [Form & conduct of the examinations](http://teaching.eng.cam.ac.uk/content/form-conduct-examinations) [3].

**UK-SPEC**

The [UK Standard for Professional Engineering Competence (UK-SPEC)](http://www.engc.org.uk/ukspec.aspx) [4] describes the requirements that have to be met in order to become a Chartered Engineer, and gives examples of ways of doing this.

UK-SPEC is published by the Engineering Council on behalf of the UK engineering profession. The standard has been developed, and is regularly updated, by panels representing professional engineering institutions, employers and engineering educators. Of particular relevance here is the [‘Accreditation of Higher Education Programmes’ (AHEP) document](http://www.engc.org.uk/standards-guidance/standards/accreditation-of-higher-education-programmes-ahep/) [5] which sets out the standard for degree accreditation.

The [Output Standards Matrices](http://teaching.eng.cam.ac.uk/content/output-standards-matrices) [6] indicate where each of the Output Criteria as specified in the AHEP 3rd edition document is addressed within the Engineering and Manufacturing Engineering Triposes.

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**Links**

[1] mailto:gmt11@cam.ac.uk  
[2] mailto:seb53@cam.ac.uk  
[3] [http://teaching.eng.cam.ac.uk/content/form-conduct-examinations](http://teaching.eng.cam.ac.uk/content/form-conduct-examinations)  
[6] [http://teaching.eng.cam.ac.uk/content/output-standards-matrices](http://teaching.eng.cam.ac.uk/content/output-standards-matrices)