

## **Engineering Tripos Part IB, 2P8: Bioengineering, 2018-19**

### **Lecturers**

Dr Guillaume Hennequin, Prof Máté Lengyel , Dr Graham Treece, and Dr S Huang

### **Timing and Structure**

Weeks 1-4 Easter term, 14 lectures + 2 examples classes, 4 hours/week.

### **Aims**

The aims of the course are to:

- enable students to appreciate the vast potential for the application of engineering principles in biology and medicine, and learn about four specific application areas in which Part I engineering principles can be applied to
- gain insight into visual processing and optimality in eye design.
- study the structure and function of the eye.
- study the design of ocular prostheses.
- study medical imaging of the components of the eye.

### **Content**

#### **Visual processing (3L, Dr Guillaume Hennequin)**

- From eye to brain.
- Spatial, depth & colour vision.
- Retinal and cortical neural prostheses.

#### **Biological vision with an engineers eye (3L, Prof Máté Lengyel)**

- Evolution in eye design:optimal optics.
- Approaching physical limits; retinal patterning and processing.
- Encoding visual scenes in the brain; optimal information processing.

#### **Imaging of the eye (4L, Dr Graham Treece)**

- Optical fundus imaging and the scanning laser ophthalmoscope.
- 2D and 3D optical coherence tomography.
- Ocular ultrasonography.
- Visualisation of 3D data.

#### **Introduction and Ocular biomechanics and biomaterials (4L, Prof Michael Sutcliffe)**

- Healthy eye and ocular biomechanics.
- Structural and mechanical diseases of the eye.
- Lens and cornea replacement and transplantation.
- Future eye repair practices:tissue engineering.

## **Booklists**

Wang, L.V. & Wu, H.-I. Biomedical Optics: Principles and Imaging, Wiley, 2007.

## Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [1].

## UK-SPEC

The [UK Standard for Professional Engineering Competence \(UK-SPEC\)](#) [2] describes the requirements that have to be met in order to become a Chartered Engineer, and gives examples of ways of doing this.

- Engineering Library: **DB.158** and Part IB Tripos shelves

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 [3] which sets out the standard for degree accreditation.

The [Output Standards Matrices](#) [4] 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] <http://teaching.eng.cam.ac.uk/content/form-conduct-examinations>

[2] <http://www.engc.org.uk/ukspec.aspx>

[3] <http://www.engc.org.uk/standards-guidance/standards/accreditation-of-higher-education-programmes-ahep/>

[4] <http://teaching.eng.cam.ac.uk/content/output-standards-matrices>