Engineering Tripos Part IIB, 4G9: Biomedical Engineering, 2021-22

Module Leader

Prof M P F Sutcliffe [1]

Lecturers

Prof M Sutcliffe (MPFS), Prof J Clarkson (PJC), Dr G Bale (GMB), Prof A Flewitt (AJF)

Timing and Structure

11 lectures; four discussion meetings. Assessment: 100% coursework

Aims

The aims of the course are to:

- Provide a comprehensive overview of biomedical engineering
- Outline the key principles of good engineering design in a biomedical context
- Introduce the concept of system design approach for sustainable improvement
- Describe the technology adoption pathway in healthcare

Objectives

As specific objectives, by the end of the course students should be able to:

- Conduct research and define the issues with existing medical devices or clinical procedures
- Understand how to apply engineering knowledge to solve biomedical challenges
- Communicate and work with healthcare professionals to validate the engineering designs
- Use a broader systems design toolkit to address larger and more complex issues in healthcare

Content

The course has four case studies. Students will 'major' on one case study, but will need to attend (either in person or via recorded lectures) the lectures pertaining to the other case studies to cover all the required elements of the course.

General introduction (3L total) [MPFS (1L); PJC (0.66L) ;PJC (0.33L); MPFS (0.33L); GMB (0.33L); AJF (0.33L)]

Introduction of biomedical engineering and systems approach to systems improvement; introduction of four case studies

Engineering design case study (2L) [PJC]

System approach in healthcare design; e.g. design of face mask/technology in the home; safety

Biomechanics case study (2L) [MPFS]

Knee biomechanics/kinematics; design for the knee replacement; clinical/patient acceptance

Biosignal processing case study (2L) [GMB]

Basics of anatomy, pathophysiology; design for optical brain monitoring; clinical trials

Biosensor case study (2L) [AJF]

Concept of point-of-care; microfluidic platform-assisted biosensors; manufacturing

Discussion meetings (5L) [Guest mentors (2L); all lecturers (3L)]

Short presentation sessions from guest mentors (University, NHS, industry) and panel discussions; open discussion meetings with lecturers

Further notes

Please note that the number of places will be is limited and if the module looks likely to be oversubscribed preference will be given to those who initially selected this module in their preliminary selections on COMET.

Coursework

Coursework	Format	Due date & marks
Initial coursework mapping 'canvas' One-page poster style document focusing on the big picture of the chosen case study Learning objective: • demonstrate the framework of systematic engineering design • encourage the student to plan the case study by raising questions • adapt a genetic system design framework to a specific project at a high level • make an initial list of foci under each key topic on the canvas template	Individual Report anonymously marked	End of week [5%]
Expanded courswork mapping ' canvas' A developed version of the first coursework element Learning objective: • provide further guidance on the canvas on the activities that need to be considered by providing example questions • reflect on an accurate problem identification, risk management, the interdependency between technical and social components in the project	Individual Report anonymously marked	End of week [25%]

Coursework	Format	Due date & marks
Interim presentation Three minute presentation and two minutes Q and A Learning objective: • express scope of the case study, significance and progress made so far • definition of the problem to be addressed, requirements, design and risk evaluation/management • plan for the remaining components to make this case study complete	Individual Presentation	End of week [20%]
Final report Twenty page final report Learning objective: • provide information on the problem formulation, requirement specification, design, risk assessment, stakeholder acceptance, marketing/policy strategy, design solution, etc.	Individual Report anonymously marked	End of week [50%]

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 [2].

Last modified: 08/01/2022 20:49

Links
[1] mailto:mpfs1@cam.ac.uk
[2] https://teaching.eng.cam.ac.uk/content/form-conduct-examinations