Engineering Tripos Part IIA Project, GM1: Multidisciplinary Design, 2021-22

Leader

Dr P J G Long [1]

Timing and Structure

Lent term: Tuesday 2-6pm (wks 4-5 + 7- 8) *** NB These times may change depending on status of pandemic regulations. Easter term project period: Thursdays 9-11 & 2-5pm (wks 1,2,3) , Mondays 11-1 (wks 1.2) Thursday 1-4pm (wk 4)

Prerequisites

One (or more) from 3C8/3F2/4C4/3F8 useful but not essential.

Aims

The aims of the course are to:

- Understanding the requirements of medical device design
- Obtain an introduction to rapid analysis of design requirements
- Experience the planning and development of the prototyping/testing stages of the design process
- Experience of using manual and computer based design tools (as required) 2D/3D CAD systems, FEA, CAM, standard and 'bespoke' DAQ & sensor systems, electrical/electronic CAD and simulation
- To assemble one or more prototype systems, using: ?Additive/Subtractive rapid manufacturing techniques ?PCB manufacture ?Sensors ?Low cost/low power micro-controllers where appropriate

Content

Working with mentors from local consultancies, NHS, care organisations and CUED staff, student teams will be tasked with developing a concept and prototype for a new 'medical' product for use in the heathcare, e.g. NHS, medical research, Assistive Technologies, care homes or domicillary care.

The brief will be relatively open but it is expected that each task will require a range of engineering techniques, typically inc.,

- Mechanical Design
  - Materials
  - Mechanism design
  - Ergonomics
- Electronic Design inc
  - Sensors
  - Data AquisitionM
  - Microprocessors
- Software
  - Data Analysis using statistics/AI
  - UI Design - development

Support will be given in the form of a number of short lectures will be given by staff and mentors on

- medical device design,
- project planning,
- presenting
- use of specific commercial software(where appropriate)
-

Mentors and staff will be available during the sessions/on-line,

Feedback from the stakeholders will be available in person/text, depending on availability

The project ends with a poster/presentation event, held a the begining of the last week of the Easter term project period, for the mentors and interested stakeholders

NB The project only runs for 3 weeks + 1 day during Easter, rather than the normal 4weeks+1 day.

NB The team nature of the project means that the it is important that all members of each team are available for all the timetabled sessions, especially those in Lent term, Tuesday afternoon 2-6pm, wks 4,5,7,8. If you think you may be unable to attend for any reason please add a note to the project coordinator when you apply for the project.

(For further deatils please contact the course leader)

FORMAT

Students will work in multidisciplinary teams of 4/5

ACTIVITIES

Lent Term

- **Week 1**
  - Introduction to Medical device design
  - Setting of tasks and teams
  - Initial research, brainstorming of ideas (Supported by mentors)
  - Generation of questions for stakeholders
  - Were appropriate access to test equipment/components
- **Week 2**
  - Discussions with, access to feedback from stakeholders, clincians
  - Introduction to NHS data systems and access
  - Problem investigation and concept development
- **Week 3**
  - Further concept development
  - Were appropriate, simple experiments
  - Planning of experimental stage during Easter term
  - Development of presentation and initial report
- **Week 4**
  - Submission of draft presentation
  - Team presentation of plans for Easter term sessions, inc
    - Work to date
    - Overall concept(s)
    - Plans/Timeline for Easter term
    - Resource requirements
  - Feedback session with mentors, stakeholders

- Submission of team report (inc resource requirements, updated as required)

Easter Term

- **Week 1**
  - Access to requested resources
  - Start experiments and software development
- **Week 2**
  - Further development work
  - Short interim report (individual)
- **Week 3**
  - Coninuing work on prototype(s)
  - Draft poster
  - Lecture on poster design and presentation
- **Week 4** (First day only)
  - Lunchtime poster session
  - Team Presentations
  - Final report submission (Individual and team)

Further notes

Examples of previous projects

- Instrumented/data logging Walking sticks
- Automated system for detection of Urinary Tract Infections
- Automated antibiotic sensitivity system
- Next generation of Stethoscope
- Remote monitoring of ear conditions
- Real time monitoring of body fluid flows
- Chyme reinfusion
- Open data collection system for the NH
- Music therapy for stroke patients
- Nutrition monitor
- Rehabilitation monitor
- Remote monitoring of physiotherapy
- Monitoring weight loss in the community

Coursework

Coursework	Due date	Marks
Presentation/Budget/Report	Lent: Term Tuesday week 8 (Last day of Lectures)	15 (5 Individual, 10 Group)
Interim report 2	Easter Term Sunday 16 May 2022	20(12 Individual, 8 Group)
Poster Session / Presentation Final individual report:	Easter term Thurs 2 June - (1) 2pm->5pm	45 (25 Individual, 20 Group)

	Friday 3 June 2022	

Examination Guidelines

Please refer to Form & conduct of the examinations [2].

Last modified: 04/01/2022 06:05

Links
[1] mailto:pjgl2@cam.ac.uk
[2] https://teaching.eng.cam.ac.uk/content/form-conduct-examinations