Engineering Tripos Part IIB, 4C5: Design Case Studies, 2019-20

Module Leader

Prof P Kristensson [1]

Lecturers

Prof P Kristensson and Prof J Clarkson [2]

Lab Leader

Prof P Kristensson

Timing and Structure

Lent term. 14 lectures + coursework. Assessment: 100% coursework

Aims

The aims of the course are to:

- illustrate the multi-disciplinary nature of engineering design.
- demonstrate the importance of considering user needs.
- illustrate the above through case studies of form, component and system design.

Objectives

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

- appreciate the importance of multi-disciplinary systems design.
- select simple components from catalogues.
- understand relations between customer requirements, commercial requirements and product forms.
- appreciate the role of aesthetics and ergonomics in engineering design.
- understand the importance of design for manufacture and assembly.

Content

The course will be based on two case studies.

Each case study will occupy eight lectures slots with the last one or two in each case study being used for coursework.

Topics to be covered within individual case studies include: multi-disciplinary systems design; component selection; risk analysis; product testing, aesthetics and ergonomics; and design for manufacture and assembly.

Notes will be handed out summarising the main points covered in each case study.

Coursework

There will be a coursework exercise linked to each of the case studies with multi-part written assignments, using computer software where appropriate.

Coursework	Format	Due date & marks
Inhaler Test Machine The purpose of this case study is to expose students to the complete design process for an inhaler test machine. Learning objectives: • to learn about solution-neutral problem statements and requirements • to learn about conceptual design • to understand and apply functionall modelling in design • to identify solution principles and sketch solutions • to learn about risk management	Two individual reports Anonymously marked	Approximatel (exact date T [30/60]
Wearable Device The purpose of this case study is to expose students to an open-ended design process that results in a systematic design of a wearable device that fulfils users' needs and is safe to use. Learning objectives: • to learn about creativity methods and user-centred design • to learn about requirements specification • to apply conceptual design techniques • to understand product architectures • to understand safety and perform risk assessment • to be able to perform verification and validation	One individual report Anonymously marked	Approximatel date TBD) [30/60]

Booklists

Please see the Booklist for Group C Courses [3] for references for this module.

Examination Guidelines

Please refer to Form & conduct of the examinations [4].

UK-SPEC

This syllabus contributes to the following areas of the UK-SPEC [5] standard:

Toggle display of UK-SPEC areas.

GT1

Develop transferable skills that will be of value in a wide range of situations. These are exemplified by the Qualifications and Curriculum Authority Higher Level Key Skills and include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills. They also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD.

IA1

Apply appropriate quantitative science and engineering tools to the analysis of problems.

IA2

Demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs.

KU1

Demonstrate knowledge and understanding of essential facts, concepts, theories and principles of their engineering discipline, and its underpinning science and mathematics.

KU2

Have an appreciation of the wider multidisciplinary engineering context and its underlying principles.

D1

Wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations.

D2

Understand customer and user needs and the importance of considerations such as aesthetics.

D4

Ability to generate an innovative design for products, systems, components or processes to fulfil new needs.

D6

Manage the design process and evaluate outcomes.

E1

Ability to use fundamental knowledge to investigate new and emerging technologies.

E3

Ability to apply mathematical and computer based models for solving problems in engineering, and the ability to assess the limitations of particular cases.

E4

Understanding of and ability to apply a systems approach to engineering problems.

P3

Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc).

P4

Understanding use of technical literature and other information sources.

US1

A comprehensive understanding of the scientific principles of own specialisation and related disciplines.

US3

An understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in engineering projects.

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