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

Module Leader
Prof P Kristensson

Lecturers
Prof P Kristensson and Prof J Clarkson

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.

<table>
<thead>
<tr>
<th>Coursework</th>
<th>Format</th>
<th>Due date &amp; marks</th>
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</thead>
<tbody>
<tr>
<td><strong>Inhaler Test Machine</strong></td>
<td>Two individual reports</td>
<td>Approximately Weeks 2 and 4 (exact date TBD) [30/60]</td>
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<tr>
<td>The purpose of this case study is to expose students to the complete design process for an inhaler test machine.</td>
<td>Anonymously marked</td>
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<td><strong>Learning objectives:</strong></td>
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<tr>
<td>• to learn about solution-neutral problem statements and requirements</td>
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<td>• to learn about conceptual design</td>
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<td>• to understand and apply functional modelling in design</td>
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<td>• to identify solution principles and sketch solutions</td>
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<td>• to learn about risk management</td>
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<tr>
<td><strong>Wearable Device</strong></td>
<td>One individual report</td>
<td>Approximately Week 8 (exact date TBD) [30/60]</td>
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<td>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.</td>
<td>Anonymously marked</td>
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<td><strong>Learning objectives:</strong></td>
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<tr>
<td>• to learn about creativity methods and user-centred design</td>
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<td>• to learn about requirements specification</td>
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<td>• to apply conceptual design techniques</td>
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<td>• to understand product architectures</td>
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<td>• to understand safety and perform risk assessment</td>
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<td>• to be able to perform verification and validation</td>
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Booklists

Please see the [Booklist for Group C Courses](http://teaching.eng.cam.ac.uk) [3] for references for this module.

Examination Guidelines

Please refer to [Form & conduct of the examinations](http://teaching.eng.cam.ac.uk) [4].

UK-SPEC

The [UK Standard for Professional Engineering Competence (UK-SPEC)](http://teaching.eng.cam.ac.uk) [5] 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://teaching.eng.cam.ac.uk) [6] which sets out the standard for degree accreditation.
The Output Standards Matrices [7] 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:pok21@eng.cam.ac.uk