Engineering Tripos Part IIB, 4C5: Design Case Studies, 2020-21

Module Leader
Dr N Crilly [1]

Lecturers
Prof J Clarkson and Dr N Crilly [2]

Lab Leader
Dr N Crilly

Timing and Structure
Lent term. 16 lecture slots, including lectures, group discussion and time for coursework. Assessment: 100% coursework

Aims
The aims of the course are to:

- illustrate the multi-disciplinary nature of engineering design
- illustrate the relationship between requirements, functions and solutions
- illustrate the importance of considering risk, error and safety
- illustrate the importance of understanding users and the contexts they operate in
- illustrate how to design for users' needs and preferences
- achieve the above through case studies of industrial systems and consumer products.

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

- analyse and develop functional requirements for multi-disciplinary systems
- identify solution principles and components from catalogues, and combine them to fulfil system requirements
- identify and analyse risks associated with the development and delivery of multi-disciplinary systems
- research, analyse and describe the needs of users in specific product usage scenarios
- analyse, develop and justify decisions about product form and function in relation to user requirements and branding constraints
- analyse, develop and justify decisions about product form and function in relation to principles of physical and cognitive ergonomics.

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; design for manufacture and assembly; user research; aesthetics; ergonomics; branding. 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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industrial System</strong></td>
<td>Two individual reports.</td>
<td>Approximately</td>
</tr>
<tr>
<td></td>
<td>Anonymously marked</td>
<td>(exact date TBD)</td>
</tr>
<tr>
<td>The purpose of this case study is to expose students to the complete design process for an inhaler test machine.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Learning objectives:**

After completing this coursework, students should be able to

- analyse and develop functional requirements for multi-disciplinary systems
- identify solution principles and components from catalogues, and combine them to fulfil system requirements
- identify and analyse risks associated with the development and delivery of multi-disciplinary systems.

<table>
<thead>
<tr>
<th>Consumer Product</th>
<th>One individual report.</th>
<th>Approximately</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anonymously marked</td>
<td>date TBD)</td>
</tr>
<tr>
<td>The purpose of this case study is to expose students to a research and development process for a design concept focussed on recreational use (sports, hobbies and pastimes).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Learning objectives:**

After completing this coursework, students should be able to

- research, analyse and describe the needs of users in specific product usage scenarios
- analyse, develop and justify decisions about product form and function in relation to user preferences and branding constraints
- analyse, develop and justify decisions about product form and function in relation to principles of physical and cognitive ergonomics.

**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 [3].
UK-SPEC

The UK Standard for Professional Engineering Competence (UK-SPEC) [4] 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 [5] which sets out the standard for degree accreditation.

The Output Standards Matrices [6] 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
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[2] mailto:nc266, pjc10