Engineering Tripos Part IIB, 4D13: Architectural Engineering, 2019-20

Module Leader (Engineering)
Dr R Foster [1]

Module Leader (Architecture)
Dr M Ramage [2]

Lecturers
Dr S Smith, Dr D Shah, Dr R Foster, Dr M Ramage [3]

Lab Leader
Dr R Foster [1]

Timing and Structure
Michaelmas term. 8 afternoons. Assessment: 100% coursework

Prerequisites
[3D3, 3D4, 3D8] useful

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

- Operate and communicate effectively in multidisciplinary design teams of architects and engineers, and present solutions to and derive useful, actionable feedback from various stakeholders (e.g. client, peers and co-professionals, constructors)
- By reflecting on and through improved understanding of the collaborative design process, apply appropriate management strategies to design innovative efficient buildings to a client’s design brief
- Appreciate the principles of architectural engineering through investigation, critical appraisal and selection of appropriate structural systems, materials, and construction techniques relevant to architectural and engineering design
- Understand and assess the environmental impact of design choices
- Demonstrate proficiency in specialized design subject matter which integrates with the team’s design solution, such as timber engineering, resource efficient design, designing for well-being, reciprocity of urban context and building design.

Content
This module is run in conjunction with the Department of Architecture. CUED students who elect to do this module will work together one full afternoon per week with final year students from the Department of Architecture. The module involves an architectural engineering design exercise, with students working in mixed groups of architects and engineers.
The course focuses on integrating architecture and engineering to produce new building designs. Developing an understanding of the challenges and opportunities presented by multidisciplinary teamwork is integral to the course.

Projects vary from year to year. The Michaelmas 2018 project was to design a tall timber building in London.

The teaching format will be unconventional. Each afternoon will probably begin with a short talk by one of the lecturers or by an external speaker. For the remaining class time, students will work (in groups) on developing environmental, structural and other strategies for their design project.

On week 6 of the course, each group will make a presentation of its design (including a physical model) to an assembled group of architectural, structural, environmental experts. Weeks 7-8 will provide an opportunity to incorporate the feedback from week 6 into the overall design and to develop aspects of the design in further detail.

### Course Schedule

All classes will be in LR3, Inglis Building, Engineering Dept., 2.00-5.00pm Thursdays.

1. **Thursday 10th October**
   - Course Introduction
     - Talk 1: Supertall Timber (Michael Ramage)
     - Groups will be allocated
     - Teams will be built

2. **Thursday 17th October**
   - Talk 2: Engineering
   - Group work

3. **Thursday 24th October**
   - Talk 3: Client
   - Group work

4. **Thursday 31st October**
   - Talk 4: Architecture
   - Group work

5. **Thursday 07th November**
   - Talk 5: Fire safety
   - Group Work

6. **Thursday 14th November**
   - **Design Review (25% mark)** Critics from a range of disciplines and backgrounds

7. **Thursday 21st November**
• Talk 6: Impacts

8. Thursday 28\textsuperscript{th} November

• Feedforward session
• Group work

Coursework

Coursework:

- 25% for the group presentation of the design and the model on week 6
- 15% for technical manual on 02/12/2019
- 60% for an individually authored report on developing an aspect of the design and analysis, to be submitted digitally on Moodle by each student by 4.00pm on the first day of the Lent Term.

<table>
<thead>
<tr>
<th>Task</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Design Review (25% mark)</td>
<td>2 pm, 14/11/2019</td>
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<tr>
<td>Technical Manual (15% mark)</td>
<td>5 pm, 02/12/2019</td>
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<tr>
<td>Individual Report (60% mark)</td>
<td>4 pm, 16/01/2020</td>
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Each group will orally present their design proposal, with 2 posters (A1 size) and a model of their building and/or visual materials to present their design. Designs will be judged on presentation, integration, creativity and feasibility of the proposal.

Each group will submit a report of 4 A4 size pages describing technical elements of their building design. Think of this as a “development proposal brochure” – it has to cover the necessary ground both briefly and in sufficient detail.

The technical manual will be judged on presentation, design rationale, technical content and creativity.

A report of 4-6 A4 size pages showing detailed analysis and outcomes of one selected element of the design. The report should clearly explain all relevant assumptions, numerical results, technical figures, with appropriate references on the experience of project work in a team.

The individual report will be assessed on presentation, design rationale and analytical content, integration with the overall group design, and critical reflection on the design process.

The 4-6 page report should be complete in itself. Secondary but relevant material may be included in appendices but will be considered to be strictly supplementary and will not be marked.

Think of this report as the detail to accompany the previous “brochure” – if you put all of your group’s reports together, you’d have a complete narrative to describe your proposal in detail.
Booklists

Please see the Booklist for Group D Courses [4] for references for this module.

Examination Guidelines

Please refer to Form & conduct of the examinations [5].

UK-SPEC

The UK Standard for Professional Engineering Competence (UK-SPEC) [6] 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 [7] which sets out the standard for degree accreditation.

The Output Standards Matrices [8] 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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