

## Engineering Tripos Part IIB, 4D10: Structural Steelwork, 2023-24

### Module Leader

[Dr J Becque](#) [1]

### Lecturers

Dr S Selvakumaran, Dr J Becque

### Lab Leader

Dr J Becque

### Timing and Structure

Michaelmas Term. 12 lectures + 2 examples classes + coursework. Assessment: 75% exam/25% coursework.

### Prerequisites

3D4 assumed, 3D3 useful.

### Aims

The aims of the course are to:

- bridge some of the gap between structural analysis, as taught in Parts I and IIA, and practical steel design as presented in design codes; however, although it will refer to the appropriate codes, it will not be an "introduction to the code" module.

### Objectives

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

- show an understanding of the background to the major codes of practice for structural steelwork.
- apply these codes thoughtfully to the design of actual steel structures.
- differentiate between the functions of compact, rolled sections and more slender, thin-walled plate-girder members.
- appreciate the vital function of joints and connectors, and understand the limitation of various jointing techniques.
- understand the performance of civil engineering composite structures.

### Content

A separate handout with numerous worked examples covers each of the sections below.

### Preliminary Details (1L)

- Steel properties and grading;
- Types of section;
- Principles of Limit-States design;
- Partial safety factors;
- British and European Standards.

**Compact Member Design (6L)**

- Flexural buckling of columns (axial loads) and effect of elastic restraints;
- Lateral torsional buckling of beams (transverse loads);
- Beam-column buckling using Interaction Equations.

**Thin-walled Member Design (3L)**

- Local buckling modes for a plate due to compression, bending and shearing;
- Definitions of compactness and effective sections for beams and columns;
- Panel performances in stiffened sections.

**Joints and Composite Construction (3L)**

- Connections for simple and continuous construction;
- Bolted joints using bearing bolts and friction bolts;
- Welded joints using butt and fillet welds;
- Fatigue life of welds;
- Classification of weld joints;
- Detailing of joints;
- Composite section types;
- Composite section design using headed shear connectors;
- Composite floor slabs using profiled decking.

**Coursework**

Design of a simple steel structure, using methods from the course. Formal report for assessment.

| Coursework                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Format                                                     | Due date<br>& marks                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------|
| <b>Design project</b><br><br>Complete design of a steel framed building, including columns, wind bracing, composite beams, roof trusses and connections.<br><br><u>Learning objectives:</u> <ul style="list-style-type: none"> <li>• Apply the knowledge gathered in the lectures to a realistic design scenario.</li> <li>• Make well-motivated conceptual design decisions.</li> <li>• Carry out a detailed design including all necessary design checks.</li> </ul> | Individual project<br><br>Report<br><br>Anonymously marked | Due on final c<br><br>25% of cours |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                            |                                    |

**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](#) [2].

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### Links

[1] <mailto:jurgen.becque@eng.cam.ac.uk>

[2] <https://teaching23-24.eng.cam.ac.uk/content/form-conduct-examinations>