Engineering Tripos Part IIB, 4D10: Structural Steelwork, 2021-22

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. This course will be delivered in-person in 2021-22.

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 steel work.
- apply these codes thoughtfully to the design of real 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 connnectors, 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 & marks
Design project Complete design of a steel framed building, including columns, wind bracing, composite beams, roof trusses and connections. Learning objectives: • Apply the knowledge gathered in the lectures to a realistic design scenario. • Make well-motivated conceptual design decisions. • Carry out a detailed design including all necessary design checks.	Individual project Report Anonymously marked	Due on final 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