Engineering Tripos Part IIB, 4D10: Structural Steelwork, 2018-19

Module Leader

Prof F A McRobie [1]

Lecturer

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Lab Leader

Prof F A McRobie [1]

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 steel work.
- apply these codes thoughtfully to the design of real steel structures.
- differentiate between the functions of compact, prefabricated sections and lightweight, 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. (Dr Seffen)

<table>
<thead>
<tr>
<th>Coursework</th>
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<th>Due date &amp; marks</th>
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**[Coursework activity #1 title / Interim]**

- Coursework 1 brief description
- Learning objective:
  - 
  - 

  Individual/group Report / Presentation

  [non] anonymously marked

  Thu week 3

  [xx/60]

**[Coursework activity #2 title / Final]**

- Coursework 2 brief description
- Learning objective:
  - 
  - 

  Individual Report

  anonymously marked

  Wed week 9

  [xx/60]
**Booklists**


**Examination Guidelines**

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

**UK-SPEC**

The [UK Standard for Professional Engineering Competence (UK-SPEC)](http://www.engc.org.uk/ukspec.aspx) [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://www.engc.org.uk/standards-guidance/standards/accreditation-of-higher-education-programmes-ahep/) [6] which sets out the standard for degree accreditation.

The [Output Standards Matrices](http://teaching.eng.cam.ac.uk/content/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:fam10@cam.ac.uk
[2] mailto:fam@eng.cam.ac.uk
[4] [http://teaching.eng.cam.ac.uk/content/form-conduct-examinations](http://teaching.eng.cam.ac.uk/content/form-conduct-examinations)
[7] [http://teaching.eng.cam.ac.uk/content/output-standards-matrices](http://teaching.eng.cam.ac.uk/content/output-standards-matrices)