# Module Specification

## Module Details

<table>
<thead>
<tr>
<th><strong>Module Title</strong></th>
<th>Design of Steel Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module Code</strong></td>
<td>CE612</td>
</tr>
<tr>
<td><strong>Credit Value</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>Level</strong></td>
<td>Level 4, Level 5, Level 6, X, Level 7, Level 8</td>
</tr>
</tbody>
</table>

### Entry Criteria for Registration on this Module

**Pre-requisites**
Specify in terms of module codes or equivalent

- CE412 and CE511 or equivalent

**Co-requisite Modules**
Specify in terms of module codes or equivalent

- None

## Module Delivery

<table>
<thead>
<tr>
<th><strong>Mode of Delivery</strong></th>
<th>Taught, Distance, Placement, Online, Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pattern of Delivery</strong></td>
<td>Weekly, Block, Other</td>
</tr>
<tr>
<td><strong>When Module is Delivered</strong></td>
<td>Semester 1, X, Semester 2, Throughout Year, Other</td>
</tr>
</tbody>
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### Brief Description of Module Content and/or Aims

**Overview (max 80 words)**

This module will enable its participants to produce safe design (based on building regulations and with limited supervision/direction) for steel structural elements and their connections, as well as their assembly and detailing into a whole steel structure. Failure modes analysis and evaluation of steel structural elements and structures enhances and extends understanding of the students about the philosophy of modern code of practice procedures for design of structures (structural Eurocodes), whose background and basic principles are explained in this module.

## Module Team/Author/Coordinator(s)

- Dr. Hamid Isfahany (ML)

## School

Environment and Technology

## Site/Campus where Delivered

This module will normally be delivered at Moulsecoomb Campus

## Course(s) for which module is appropriate and status on that course

<table>
<thead>
<tr>
<th><strong>Course</strong></th>
<th><strong>Status (mandatory/compulsory/optional)</strong></th>
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</thead>
<tbody>
<tr>
<td>BEng (Hons) Civil Engineering</td>
<td>Compulsory</td>
</tr>
<tr>
<td>BEng (Hons) Civil Engineering (Degree Apprenticeship)</td>
<td>Compulsory</td>
</tr>
<tr>
<td>BEng (Hons) Civil Engineering with Integrated Foundation Year</td>
<td>Compulsory</td>
</tr>
<tr>
<td>BEng (Hons) Civil Engineering with Construction Management</td>
<td>Compulsory</td>
</tr>
<tr>
<td>BEng (Hons) Civil with Environmental Engineering</td>
<td>Compulsory</td>
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</tbody>
</table>

Module descriptor template: updated Aug 2014
<table>
<thead>
<tr>
<th>MEng Civil Engineering</th>
<th>Compulsory</th>
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<tr>
<td>MEng Civil Engineering with Integrated Foundation Year</td>
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<td>MEng Civil Engineering with Construction Management</td>
<td>Compulsory</td>
</tr>
<tr>
<td>MEng Civil with Environmental Engineering</td>
<td>Compulsory</td>
</tr>
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</table>

## MODULE AIMS, ASSESSMENT AND SUPPORT

### Aims

The module aims to:

- provide students with a sound knowledge of the behaviour and design of structural steel members, as well as their connections, and to deepen their understanding and application of modern codes of practice procedures (Eurocodes), national annex and UK building regulations.
- introduce the ability to design a structural system, underpinned by functionality, safety and stability, buildability, and economic objectives.

### Learning outcomes

On successful completion of the module the student will be able to:

- **LO1** - evaluate and describe the failure modes for common forms of structural steel members and their connections in steel structures
- **LO2** - analyse and propose conceptual ideas, establish design criteria given limiting conditions and propose detailed designs for steel members and their connections
- **LO3** - establish and apply knowledge of how safety is ensured in structural steel design and produce checkable calculations
- **LO4** - sketch conceptual ideas of structural design, propose alternative design for common steel structural systems and produce detailing for structural drawings
- **LO5** - utilise the industry best practice guidelines and codes of practice for the loading, analysis and detailed design of steel structures
- **LO6** - develop a holistic approach to design through systematic evaluation of the process and prevention of failure in steel structures

### Content

- Background to modern codes of practice; Limit state design philosophy.
- Understanding of, partial safety factors for loads and qualitative appraisal of actions on structures.
- Material behaviour and section properties (structural steelwork elements, Young Modulus, Shear Modulus, nominal values of yield strength and ultimate tensile strength, as well as partial safety factors).
- Structural form and behaviour for steel structures and their elements.
- Failure modes analysis of steel structural elements and structures.
- Members in tension: with/-out holes, and effect of staggered holes.
- Members in compression: behaviour, effective length and buckling.

Module descriptor template: updated Aug 2014
- Restraint beams in bending: ultimate and serviceability limit states.
- Combination of effects: bending + shear and bending + compression.
- Design for lateral torsion buckling of beams.
- Design for portal frames.
- The ideal structural joint and joint components
- Design of bolted and welded joints.
- Behaviour and arrangement of joints (pinned joints and rigid joints)
- Steel Detailing (the production of shop drawings for a steel fabricator to cut and weld all the necessary members together).
- Detailing rules for steel structures and detailing practice/conventions.
- Link between good detailing and construction costs.

### Learning support

**Recommended Reading list, latest edition of the following texts:**


**Industry guidelines and Codes of Practice:**

- *Eurocodes and National Annex available online at British Standards Online (BSOL) website*

**Key Websites:**

- [http://bsol.bsigroup.com](http://bsol.bsigroup.com), Also accessible through university library resources a-z. [http://libguides.brighton.ac.uk/az.php?a=b](http://libguides.brighton.ac.uk/az.php?a=b)
- Construction Information Service (CIS) database accessible through Library resources a-z. [http://libguides.brighton.ac.uk/az.php?a=c](http://libguides.brighton.ac.uk/az.php?a=c)
- Continuing Education in Structural Connections, Leonardo da Vinci
### Teaching and learning activities

**Details of teaching and learning activities**

This module will be delivered as a mixture of lectures and tutorials, as well as facilitated group discussions and a coursework. The coursework provides an opportunity for teamwork and discussion, during which students will be designing a steel structure. The situation is very similar to that of a professional design project.

**Scheduled teaching hours**

- **Lectures**: 4.5 Hours / week (49.5 Hours in total)
- **Tutorials**: 1.5 hour / week (16.5 Hours in total)

**Formative assessment**

*Formative assessment for the exam* will be provided using in class mock tests at the beginning of each session until mid-semester exam, where students will be able to test their own ability and obtain appropriate feedback (including a peer review). Immediate feedback is provided to the students (as detailed solutions) at the end of each mock test. During some tutorial sessions, students will be checking each other’s design, as it is custom in practice.

*Formative assessment for the coursework* (which is a design project) is in form of weekly progress review and tutor will provide feedback (including a peer review, where students will be checking each other’s design) throughout various design stages.

### Allocation of study hours (indicative)

Where 10 credits = 100 learning hours

<table>
<thead>
<tr>
<th>Activity</th>
<th>Study hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCHEDULED</strong></td>
<td>66</td>
</tr>
<tr>
<td><strong>GUIDED INDEPENDENT STUDY</strong></td>
<td>134</td>
</tr>
<tr>
<td><strong>PLACEMENT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL STUDY HOURS</strong></td>
<td>200</td>
</tr>
</tbody>
</table>

### Assessment tasks

**Details of assessment on this module**

The summative assessment comprises of the following tasks:

**EXAMINATION** (50%)

An unseen closed-book (an aide memoire will be provided) 1.5-hour mid semester test under exam condition to assess LO1, LO2, LO3 and...
**LO5.**

**COURSEWORK; Calculation report on design (50%)**

End of semester design project to assess LO3, LO4, LO5 and LO6: a group design project, where the overall context of the assembly of elements and connections is explored. A typical group will include 3-4 students, with expected individual effort of 18 hours per student in assessment task preparation. The performance of individual students will be assessed through the extent and quality of their contributions within the design project.

### Types of assessment task

<table>
<thead>
<tr>
<th>Types of assessment task</th>
<th>% weighting</th>
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<tbody>
<tr>
<td>WRITTEN</td>
<td></td>
</tr>
<tr>
<td>Written exam</td>
<td>50</td>
</tr>
<tr>
<td>COURSEWORK</td>
<td></td>
</tr>
<tr>
<td>Written assignment/ essay, report, dissertation, portfolio, project output, <strong>set exercise</strong></td>
<td>50</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
</tr>
<tr>
<td>Oral assessment and presentation, practical skills assessment, <strong>set exercise</strong></td>
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**EXAMINATION INFORMATION**

**Area examination board**  Built Environment and Civil Engineering

Refer to University for guidance in completing the following sections

**External examiners**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position and institution</th>
<th>Date appointed</th>
<th>Date tenure ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr S Mitchell</td>
<td>Senior Lecturer, University of Portsmouth</td>
<td>01/10/2017</td>
<td>30/09/2021</td>
</tr>
<tr>
<td>Dr C Malaga-Chuquitaye</td>
<td>Lecturer, Imperial College London</td>
<td>01/10/2017</td>
<td>30/09/2021</td>
</tr>
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**QUALITY ASSURANCE**

**Date of first approval**

July 2017

**Date of last revision**

May 2019

**Date of approval for this version**

Q&S Editorial change August 2019

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1 Set exercises, which assess the application of knowledge or analytical, problem-solving or evaluative skills, are included under the type of assessment most appropriate to the particular task.

Module descriptor template: updated Aug 2014
| Version number | 3.2 |
| Modules replaced | CN228 |
| Specify codes of modules for which this is a replacement | ![X] |
| Available as free-standing module? | Yes | X | No |