

ES3G2-15 Steel Structures

22/23

Department

School of Engineering

Level

Undergraduate Level 2

Module leader

Irwanda Laory

Credit value

15

Module duration

24 weeks

Assessment

30% coursework, 70% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

ES3G2-15 - Steel Structures

[Module web page](#)

Module aims

The appraisal and design of structures is the main activity of many professional civil engineers. Study of the structural behaviour, analysis and design of steel structures is therefore a principal part of civil engineering teaching and is essential for professional accreditation. Structural engineering is a substantial economic activity.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Introduction to steel structures: Structures for buildings and bridges and the design process: types and forms of structure; load paths; choice of structural materials (steel grades); design of individual members and connections; influence of imperfections, design for construction methods; H&S issues (e.g. CDM 2014); sustainable construction and the client's view. Eurocode system for

limit state design: loads and load combinations and arrangements; ULS (resistance) and SLS; (deflections and vibration), robustness (Building Regulations), frame stability, fire design and durability.

Plastic collapse analysis: ULS for members and frames, to limit analysis, mention of shakedown; interpretation of results for the design process.

Geometric properties of steel sections.

Design process: Tension struts, Local buckling and classification, Laterally-restrained beams; (bending moment and shear), Uniform and non-uniform torsion: Unrestrained and restrained warping, Laterally-unrestrained beams - lateral-torsional buckling, Column members; buckling curves; interaction of bending and axial compression.

Introduction to Connections and Joints, and flooring systems.

Overall stability of frames: Second-order P- effects; elastic critical buckling loads and beam-column members. Design process: cr and Merchant-Rankine formula modification.

Learning outcomes

By the end of the module, students should be able to:

- Critically understand the function of structures as load-bearers and the response of members, joints and frames.
- Propose concepts for common civil engineering structures of steel, particularly those related to buildings.
- Analyse common building structures to determine response to load.
- Determine form and size of structural elements
- Sketch structural solutions and prepare structural calculations.
- Appraise alternative structural solutions and examine critically the results of structural analysis.
- Appreciate the needs of clients and relationship between design and safety.

Indicative reading list

Martin, L. and Purkiss, J., Structural Design of Steelwork - To EN 1993 and EN 1994, 3rd Ed., Butterworth-Heinemann, Oxford, 2008.

Davison, B. and Owens, G.W. (Eds.) Steel Designer's Manual, Wiley-Blackwell, 7th edition, 2012.

Roberts, J., Structural Eurocodes - Extracts from the Structural Eurocodes for Students of Structural Design (3rd Edition): (PP 1990:2010), BSI Standards Ltd, 2010.

Subject specific skills

Design, make and break activities, visit, lectures, examples classes and webinars.

Transferable skills

No transferable skills defined for this module.

Study

Study time

| Type | Required |
|-------------------|-----------------------------|
| Lectures | 21 sessions of 1 hour (14%) |
| Practical classes | 3 sessions of 1 hour (2%) |
| Fieldwork | 2 sessions of 1 hour (1%) |
| Other activity | 6 hours (4%) |
| Private study | 118 hours (79%) |
| Total | 150 hours |

Private study description

118 hours of guided independent learning (including VLE use and support from Employer)

Other activity description

6 hours of examples classes

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D2

| | Weighting | Study time |
|--|-----------|------------|
| Written report | 30% | |
| Laboratory written report (maximum length 6 pages) | | |
| Online Examination | 70% | |
| QMP | | |
| ~Platforms - AEP,QMP | | |

- Online examination: No Answerbook required

Weighting

Study time

- Students may use a calculator
- Engineering Data Book 8th Edition
- Graph paper

Feedback on assessment

- Reflective report upon practice: cohort level feedback returned.
- Feedback in examples classes.
- Model solutions to questions for exam preparation.
- Cohort level feedback on examination.

[Past exam papers for ES3G2](#)

Availability

Pre-requisites

Construction Materials
Structural Analysis.

Courses

This module is Core for:

- Year 3 of DESA-H221 Undergraduate Civil and Infrastructure Engineering (Non-integrated Degree Apprenticeship)