

# ES3G2-15 Steel Structures

**21/22**

**Department**

School of Engineering

**Level**

Undergraduate Level 3

**Module leader**

Irwanda Laory

**Credit value**

15

**Module duration**

24 weeks

**Assessment**

30% coursework, 70% exam

**Study location**

University of Warwick main campus, Coventry

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## 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.

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# 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.

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## Assessment

You must pass all assessment components to pass the module.

### Assessment group D1

	Weighting	Study time
Lab Report	30%	
Lab report (2500 words)		
Online Examination	70%	
QMP		
~Platforms - AEP,QMP		

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- 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: individual feedback returned.
- Feedback in examples classes.
- Model solutions to questions for exam preparation.
- Cohort level feedback on examination.

[Past exam papers for ES3G2](#)

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## 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)