

ES2H4-15 Structural Analysis and Design

26/27

Department

School of Engineering

Level

Undergraduate Level 2

Module leader

Reyes Garcia

Credit value

15

Module duration

12 weeks

Assessment

40% coursework, 60% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Structural Analysis and Design

Module aims

The aim of the module is to introduce the rationale behind appraisal and design of structures; the main activity of many professional civil engineers. The module will lay the foundations for more advanced and specific structure design modules, since it will review and more deeply explain fundamental structural analysis concepts such as stress and strain, statically determinacy and bending moment/shear forces.

The module will also provide an introduction to the use of digital tools (SAP2000) for the study of structural engineering analysis problems.

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.

STRUCTURAL ANALYSIS

- o Stress and Strain: combination and failure criteria
- o Static determinacy.
- o Statically indeterminate 2D frames.
- o Elastic theory of bending and torsion
- o Linear elastic analysis of statically determinate and indeterminate structures
- o Qualitative structural analysis
- o Introduction to eurocodes: design of primary structural elements
- o Loads patterns
- o Partial factors

DIGITAL TOOLS - FEM AND SAP2000

Use of SAP2000 in civil engineering analysis and design problems

- Introduction to SAP2000
- Use of SAP2000 in civil engineering problems

Learning outcomes

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

- Demonstrate detailed understanding of stress and strain states in structural elements and its implications for the design of structural systems [M1(M), M2(M), M3(M)]
- Extend understanding of how structures behave, and can be analysed and designed to meet specific requirements [M1(M), M2(M), M3(M), M5(D)]
- Perform qualitative and quantitative structural analysis [M1(M), M2(M), M12(D)]
- Analyse systems with various degrees of indeterminacy [M1(M), M2(M), M3(M)]
- Demonstrate detailed understanding of the elastic analysis and behaviour of statically indeterminate structures, and to show key implications of redundancy [M1(M), M2(M), M3(M)]

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

Knowledge and understanding of the need for a high level of professional and ethical conduct in engineering. Knowledge and understanding of risk issues related to structural failure.

Ability to use and interpret structural analysis outcomes for the preliminary design of structural members.

Ability to apply relevant practical skills.

Transferable skills

Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions Plan self-learning and improve performance, as the foundation for lifelong

Study

Study time

Type	Required
Lectures	10 sessions of 1 hour (7%)
Seminars	5 sessions of 1 hour (3%)
Practical classes	3 sessions of 3 hours (6%)
Supervised practical classes	1 session of 3 hours (2%)
Other activity	6 hours (4%)
Private study	117 hours (78%)
Total	150 hours

Private study description

117 hours of guided independent learning

Other activity description

1 hr Revision
5 hrs Example Classes

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D

Assessment component	Weighting	Study time	Eligible for self-certification
Structural Analysis Report	40%		Yes (extension)

Weighting **Study time**

Eligible for self-certification

Structural Analysis Report (8 pages) on the study of structural analysis problems using SAP2000

Reassessment component is the same

Assessment component

Centrally-timetabled examination (On-campus)

60%

No

Written Exam

-
- Engineering Data Book 8th Edition
 - Answerbook Pink (12 page)
 - Students may use a calculator
 - Graph paper

Reassessment component is the same

Feedback on assessment

- Feedback in example classes.
- Model solutions to questions for exam preparation.
- Cohort level feedback.
- Individual feedback on report.

[Past exam papers for ES2H4](#)

Availability

Pre-requisites

To take this module, you must have passed:

- All of
 - [ES196-15 Engineering Structures](#)

Post-requisite modules

If you pass this module, you can take:

- ES3E2-15 Civil Engineering Design II
- ES3D1-15 Concrete Structures
- ES3D2-15 Steel Structures

Courses

This module is Core for:

- Year 2 of UESA-H216 BEng Civil Engineering
- Year 2 of UESA-H217 MEng Civil Engineering

This module is Option list A for:

- Year 2 of UESA-H112 BSc Engineering