

Module specification

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Module Code	AUR4A3
Module Title	Structural Mechanics
Level	4
Credit value	10
Faculty	Faculty of Arts, Computing & Engineering
HECoS Code	100579
Cost Code	GABE

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng (Hons) Civil Engineering Degree Apprenticeship	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	18 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	6 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	24 hrs
Placement / work-based learning	0 hrs
Guided independent study	76 hrs
Module duration (total hours)	100 hrs

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Initial approval date	3 rd July 2024
With effect from date	
Date and details of revision	



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Version number	1

Module aims

This module aims to provide the learner with an informed understanding of the analysis and design of common structural elements in accordance with the requirements of established European and United Kingdom standards, codes of practice and technical guidance.

The module will explain the mathematical processes associated with the analysis of load distribution and the effects of such conditions on the design of structural elements in the various materials that are available to the structural engineer.

Module Learning Outcomes - at the end of this module, students will be able to:

1	Use first principles of maths, engineering, and appropriate computational techniques, to calculate bending moments and shear forces for simple structures.
2	Use first principles of maths, engineering, and appropriate computational techniques, to calculate bending deflections for simple structures.
3	Use first principles of maths and engineering, to assess the behaviour of elastic columns under axial loading.
4	Select and use technical literature, design codes and standards (including environmental) and other sources of information to explore design methods for steel and concrete beams and columns.

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Coursework (2000 words) will comprise of a series of tasks to include:

- Calculation of reactions, shear force, bending moments and deflection for beams.
- Calculate safe loading for columns.
- Using standard Codes of Practice / Eurocodes to design beams and columns in a variety of materials for simple loading conditions

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1,2,3 & 4	Coursework	100

Derogations

None



Learning and Teaching Strategies

The module will be presented to students through planned lecture series and programmed workshops and tutorials. An active and inclusive approach is used to engage students in the topics and will involve individual, group work and flipped learning experiences aligned to the university's Active Learning Framework (ALF). The approach offers students a flexible and adaptive learning experience that can accommodate a range of options that includes both on campus learning and remote learning where appropriate.

The Moodle VLE and other on-line materials and resources will be available to support learning. ALF offers a balance between the classroom elements and digitally enabled activity incorporating flexible and accessible resources and flexible and accessible feedback to support learning.

A didactic delivery method will be used in demonstrating mathematical processes in the application of theory-based methodologies applied to the analysis and design of structural components.

It is important that students are effectively supported in the development of those mathematical competencies associated with this module through tutorials and instruction, to ensure computational proficiency in the interpretation of module content.

Instructive methods of delivery will be supported by individual and small-group tutorials that analyse the structural characteristics of a range of materials, components and loading conditions towards appropriate design solutions.

Whilst mathematical analysis is essential to the development of understanding throughout the delivery of the module, analytical processes and techniques should be contextualised as far as possible in terms of the selection of available materials, sections, and components, and in the application and use of specialist software in contemporary structural engineering practise.

Indicative Syllabus Outline

Bending moments and shear forces: analyse cantilevers, fixed end, simply supported beams.

Analysis of pin-jointed frames including trusses

Analysis of rigid jointed frames

Bending deflections: Bending deflections for cantilevers and simply supported beams using Mohr's Moment-Area method, or Macauley's method.

Elastic columns: Behaviour of slender elastic columns under axial loading, elastic buckling using Euler's method. Eurocodes

Limit State Design

Design methods for simply supported beams: Produce valid designs for simply supported beams in a range of materials; examine the concept of limit state design; investigate stresses and deflections.

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update.



Essential Reads

Durka, F. Morgan, W. Nageim, H. and Williams, D. (2010), *Structural Mechanics: Loads, Analysis, Materials and Design of Structural Elements*. 7th Edition. Pearson.

Indicative Reads

Draycott, T., Bullman, P. (2009), *Structural Elements Design Manual Working with Eurocodes*. 2nd ed. Oxford: Elsevier.

Chanakya, A. (2009), *Design of Structural Elements, Concrete, Steelwork, Masonry and Timber*, 3rd ed. Oxon: Taylor & Francis.

Anthony, A. et al. (2007), *Reynolds's Reinforced Concrete Designer's Handbook*. 11th Ed. Taylor & Francis.

Other sources

Chartered Institute of Architectural Technologists www.ciat.org.uk

Chartered Institute of Building www.ciob.org.uk

Ordnance Survey www.ordnancesurvey.co.uk/

Royal Institution of Chartered Surveyors www.rics.org

Institution of Civil Engineers www.ice.org.uk

Royal Institute of British Architects www.architecture.com

Designing Buildings Wiki www.designingbuildings.co.uk

Institution of Structural Engineers (www.istructe.org.uk)

IHS Database www.ihsti.com