Module specification

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Module code	AURH457
Module title	Structural Analysis and Design
Level	4
Credit value	20
Faculty	Arts, Science and Technology
Module Leader	Louise Duff
HECoS Code	100153
Cost Code	GABE

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
HNC Civil Engineering	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	48 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	0 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**48** hrs
Placement / work based learning	0 hrs
Guided independent study	152 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	13/4/21
With effect from date	01/09/21

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Date and details of revision	28/06/2021 Administrative update to module code
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 upon 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	Analyse bending moments and shear forces for simple structures.
2	Calculate bending deflections for simple structures.
3	Assess the behaviour of elastic columns under axial loading.
4	Explore design methods for steel, reinforced concrete beams and columns.

Assessment

Indicative Assessment Tasks:

1. Manually calculate reactions, shear force, bending moments and deflection for beams and three pin frames and confirm calculations using suitable software. Calculate safe loading for columns using Euler's method. (2000 words equiv.)
2. Calculate safe loading for beams or columns using Euler's method. Using standard Codes of Practice, design beams and columns in a variety of materials for simple loading conditions. (2 hours)

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1& 2	Coursework	50
2	3 & 4	In-class test	50

Derogations

None

Learning and Teaching Strategies

The delivery is required to be didactic 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 and simply supported beams, analyse three pin 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.

Design methods for simply supported beams: Produce valid designs for simply supported beams in steel, reinforced concrete and timber; examine the concept of limit state design; investigate stresses and deflections.

Design methods for columns: Produce valid designs for columns in steel, timber and masonry; and for short columns in reinforced concrete.

Indicative Bibliography:

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

Essential Reads

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

Chanakya, Aiya, (2009) Design of Structural Elements, Concrete, Steelwork, Masonry and Timber, 3rd Edition, Taylor & Francis, Oxon.

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

Durka, F. et al (2002) Structural Mechanics: Loads, Analysis, Design and Materials. 6th Ed. Prentice Hall.

Fiona, C. (2008) Structural Engineer's Pocket Book. 2nd Ed. Butterworth-Heinemann.

Hulse, R. and Cain, J. (2000) Structural Mechanics. 2nd Rev Ed. Palgrave Macmillan.

McKenzie, W. (2003) Design of Structural Elements. Palgrave Macmillan.

Mosley, H. (2007) Reinforced Concrete Design. 6th Rev Ed. Palgrave.

Ozelton, E. (2006) Timber Designers' Manual. Wiley-Blackwell.

Seward, D. (2003) Understanding Structures: Analysis, Materials, Design. 3rd Rev Ed. Palgrave Macmillan.

Smith, P. (2001) An Introduction to Structural Mechanics. Palgrave Macmillan.

Steel Construction Institute (2005) Steel Design Manual. 6th Ed. Wiley-Blackwell.

Other indicative reading

New Civil Engineer Journal

Institution of Civil Engineers Proceedings

The Institution of Structural Engineers

International Association for Bridge and Structural Engineering

Chartered Institution of Civil Engineering Surveyors

BS EN 1990: Basis of Structural design 2005

BS EN 1991: Eurocode 1: Actions on structures 2006

BS EN 1992: Eurocode 2: Design of concrete structures 2006

BS EN 1993: Eurocode 3: Design of steel structures 2007

BS EN 1994: Eurocode 4: Design of composite steel and concrete structures 2005

BS EN 1995: Eurocode 5: Design of timber structures 2004

BS EN 1996: Eurocode 6: Design of masonry structures 2006

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes

Enterprising

Key Attitudes
Confidence
Adaptability

Practical Skillsets

Critical Thinking
Communication