

University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Structural Engineering 1			
Code: ENGG09013	SCQF Level: 9 (Scottish Credit and Qualifications Framework)	Credit Points: 20	ECTS: 10 (European Credit Transfer Scheme)
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Alrazi Earij		
Summary of Module			
<u>Structural Analysis: Qualitative</u>			
<ul style="list-style-type: none"> • Pin-jointed trusses subject to two-point loads. • Beams: single-span and continuous (multi-span). • Frames with no sway. 			
<u>Structural Analysis: Quantitative</u>			
<ul style="list-style-type: none"> • Statically-determinate structures with both continuous and pin-jointed elements. • Method of Sections for pin-jointed trusses. • Varying-distributed loads on single-span beams. • The Moment Distribution (MD) Method: <ul style="list-style-type: none"> • Theory of indeterminate analysis. <ul style="list-style-type: none"> • Basic elements of the MD Method. • Continuous (multi-span) beams, frames with no sway, pinned supports, cantilevered elements, conditions of symmetry and anti-symmetry. 			
<u>Reinforced Concrete Design to BS EN1992-1-1: 2004 + A1: 2014</u>			
<ul style="list-style-type: none"> • Design of one-way spanning slabs: bending, shear, deflection and reinforcement detailing. • Analysis of concrete structures; elastic methods, no-sway and sway frames, max-min load combinations, use of coefficients and approximations for bending moments and shear forces. • Design of continuous beams with moment redistribution; moment-rotation behaviour of a cross-section. • Design of columns: braced and unbraced, short and slender, carrying axial forces and moment. • Design of pad foundations: axially-loaded, bending, shear and punching shear, other types of foundation. • Introduction to reinforced concrete detailing. 			
<u>General Design</u>			

- Methods of ensuring structural stability: bracing, shear walls, rigid joints; robustness of structures.
- Flooring systems: timber, steel, and reinforced concrete systems.
- Introduction to the seismic behaviour of structures.
- Sustainability with reference to material selection and structural design.

This Module aims at supporting students in developing their UWS graduate attributes, namely: Academic (critical and analytical thinking, inquiring, knowledgeable, innovation, and problem-solving); Personal (effective communicator, creative, imaginative); Professional (Collaborative, research-minded, and socially responsible).

This module is delivered in a 'Face-to-Face' mode with on-campus lectures and practical tutorials designed for interactive and applied learning, and a closed-book class test.

Module Delivery Method					
Face-To-Face	Blended	Fully Online	HybridC	Hybrid 0	Work-Based Learning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
See Guidance Note for details.					

Campus(es) for Module Delivery						
The module will normally be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	<input checked="" type="checkbox"/>	Term 2	<input type="checkbox"/>	Term 3	<input type="checkbox"/>

Learning Outcomes: (maximum of 5 statements) These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module. At the end of this module the student will be able to:	
L1	Analyse structural beams and frames using a range of qualitative and quantitative methods.

L2	Design a range of elements of a reinforced-concrete building by a range of methods in accordance with Eurocode Standard BS EN1992-1-1: 2004 + A1: 2014.
Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:
Knowledge and Understanding (K and U)	<p>SCQF Level 9</p> <ul style="list-style-type: none"> • Demonstrate a broad and integrated knowledge and understanding of the scope, main areas and boundaries of the topics covered in these key component areas of structural analysis and design. • Demonstrate further knowledge and understanding of essential facts, concepts, theories and principles of the topics of this module and detailed knowledge in some of these areas. • Demonstrate detailed knowledge in some of these areas. • Further develop knowledge and understanding of characteristics of reinforced concrete as a structural material. • Further develop knowledge and understanding of the characteristics of the structural design process, and specifically those of reinforced concrete in the contexts of using the Eurocode standard BS EN1992-1-1.
Practice: Applied Knowledge and Understanding	<p>SCQF Level 9</p> <ul style="list-style-type: none"> • Use some routine skills and practices within the area of engineering mechanics. • Develop knowledge, understanding and practical engineering skills acquired through work carried out in problem-based learning. • Select and critically evaluate technical literature and other sources of information to solve complex problems. • Use practical laboratory and workshop skills to investigate complex problems.
Generic Cognitive skills	<p>SCQF Level 9</p> <ul style="list-style-type: none"> • Identify and analyse routine professional problems and issues. • Use a range of approaches to formulate evidence-based solutions to design problems, which invokes skills including critical analysis and evaluation and some synthesis. • Further develop the ability to apply appropriate quantitative mathematical, scientific and engineering tools to the analysis of basic problems. • Progress the ability to use appropriate design codes of practice and industry standards, which in this degree programme are the appropriate Eurocode standards.

Communication, ICT and Numeracy Skills	<p>SCQF Level 9</p> <ul style="list-style-type: none"> • Interpret, use and evaluate numerical and graphical data to achieve goals/targets. • Further develop numeracy skills in structural analysis and design. • Further develop graphical communication skills through drawings prepared as a component of the series of design coursework. 	
Autonomy, Accountability and Working with others	<p>SCQF Level 9</p> <ul style="list-style-type: none"> • Exercise some autonomy and initiative in selecting and justifying structural design solutions. • Work under the guidance of the academic staff, who are professionally-qualified practitioners. • Further develop skills in planning self-learning and improving performance, as the foundation for lifelong learning/CPD. • Further develop organisational skills of learning and practice in structural analysis and design. 	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG08011	Module Title: Design of Structural Elements
	Other:	Appropriate knowledge of mathematics and fundamentals of structural mechanics; or equivalent to the above module.
Co-requisites	Module Code:	Module Title:

*Indicates that module descriptor is not published.

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
<p>Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:</p>	<p>Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)</p>
Lecture/Core Content Delivery	24
Tutorial/Synchronous Support Activity	12

Laboratory/Practical Demonstration/Workshop	12
Independent Study	152
	200 Hours Total

****Indicative Resources: (eg. Core text, journals, internet access)**

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

- Earij, A. "Structural Analysis Notes & Tutorial Problems", the University of the West of Scotland, available on myUWS.
- Wrzesien, A. "Structural Design Notes & Tutorials": available on myUWS.
- Selected extracts from Eurocodes 0, 1 and 2, and information on specific National Annex rules.
- SOFTWARE: Autodesk AutoCAD, Autodesk Revit, Autodesk Robot Structural Analysis, Concrete Centre Spreadsheets for Design to BS EN1992-1.

Extension Resources: Consultation of the undernoted resources is recommended and material from these resources may be of benefit to the student in the assessment process.

- Brohn, D. (1984), "Understanding Structural Analysis", New Paradigm.
 - Ghali, A., Neville, A. & Brown, T. (2017), "Structural Analysis: A Unified Classical and Matrix Approach", Spon Press.
 - MacLeod, I. A. (2005), "Modern Structural Analysis: Modelling Process and Guidance", Thomas Telford.
 - Megson, T.H.G. (1995), "Structural and Stress Analysis", Elsevier Butterworth-Heinemann.
 - IStructE, "Manual for the Design of Concrete Building Structures to Eurocode 2"
 - Martin, L.H., Croxton, P.C.L., and Purkiss, J.A. (2005), "Concrete Design to EN1992-1", Edward Arnold.
 - Mosley, W.H., Hulse, R, and Bungey, J.H., "Reinforced Concrete Design", Palgrave (Macmillan).
 - Reynolds, C.E., and Steedman, J.C. (1997), "Reinforced Concrete Designer's Handbook", Spon.
 - IStructE, "Standard Method of Detailing Structural Concrete - a Manual for Best Practice".
 - Steel Construction Institute, Davison, B. and Owens G.W., "Steel Designers Manual", Wiley-Blackwell.
 - Montague, P. and Taylor, R. (1989), "Structural Engineering", McGraw Hill.
 - Westbrook, R. (1996), "Structural Engineering Design in Practice", Longman.
- Please ensure the list is kept short and current. Essential resources should be included, broader resources should be kept for module handbooks / Aula VLE.

Resources should be listed in Right Harvard referencing style or agreed professional body deviation and in alphabetical order.

(**N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the [Student Attendance and Engagement Procedure](#): Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: [UWS Equality, Diversity and Human Rights Code](#).

Please ensure any specific requirements are detailed in this section. Module Co-ordinators should consider the accessibility of their module for groups with protected characteristics..

The programme leaders have considered how the programme meets the requirements of potential students from minority groups, including students from ethnic minorities, disabled students, students of different ages and students from under-represented groups. Students with special needs (including additional learning needs) would be assessed/accommodated and any identified barriers to particular groups of students discussed with the Enabling Support Unit and reasonable adjustments would be made for classes and site visits.

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School).

Supplemental Information

Divisional Programme Board	Engineering
Assessment Results (Pass/Fail)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
School Assessment Board	Civil Engineering and Quality Management
Moderator	Andrzej Wrzesien
External Examiner	M. Bock
Accreditation Details	This module is accredited by the Joint Board of Moderators (JBM) as part of the BEng (Hons) Civil Engineering, and BEng GA (Hons) in Civil Engineering.

Changes/Version Number	V3.07: Updated 'Summary of Module' – last paragraph – to reflect the updated delivery mode and assessment. Updated 'Module Delivery Method' to 'Face-to-Face' only. Updated 'Assessment 1' to 'Closed-Book Class Test'.
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Assessment: (also refer to Assessment Outcomes Grids below)
Assessment 1: Closed-Book Class Test - 60%
Assessment 2: Assignment - 40%
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Assessment Outcome Grids (See Guidance Note)

Component 1				
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Closed-Book Class Test	√	√	60	2

Component 2				
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Design/ Diagram/ Drawing/ Photograph /Sketch	√	√	40	0

Combined Total for All Components			100%	2 hours
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