

University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Design of Structural Elements			
Code: ENGG08011	SCQF Level: 8 (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:	Andrzej Wrzesien		
Summary of Module			
<p>General Taking-off permanent and variable (imposed) characteristic loads. Design philosophy, limit states, partial safety factors for loads and material strengths, design load combinations for ultimate and serviceability limit states. Sustainability - with reference to low energy/impact material selection, life cycle assessment and structural design.</p> <p>Structural Steelwork Design Design to Eurocodes BS EN 1993-1-1, EN 1993-1-8, EN 1990 and EN 1991-1-1: Introduction to philosophy: limit states, partial factors. Standard steel sections: UB, UC, RHS and CHS Local buckling. Cross-section classification classes 1 to 4. Design of beams with full lateral restraint: bending, shear, and deflection. Design resistance of beam webs in buckling and bearing. Design of eccentrically loaded connections; tension & shear, torsion shear, bolted and welded. Design of axially loaded columns: buckling parameters, restraints, slenderness, buckling lengths, compression resistance; compound columns.</p> <p>Structural Timber Design Design to Eurocodes BS EN 338, EN1995-1-1, EN 1990 and EN 1991-1-1: Design effects of actions (loads): bending, shear, bearing, and deflection. Characteristic strengths and stiffness of timber (BS EN338). Design resistance capacities of timber members in bending, shear, bearing, and deflection.</p> <p>Reinforced Concrete Design Design to Eurocodes BS EN 1992-1-1, EN 1990 and EN 1991-1-1: Design effects of actions (loads): bending, shear, and deflection. Characteristic strengths of concrete and reinforcing steel. Design resistance capacities of reinforced concrete members in bending, shear, and deflection. Introduction to reinforcement arrangements and detailing in slabs. This module will support students to develop the following UWS graduate attributes: Academic - critical and analytical thinking, inquiring, knowledgeable, digitally literate, innovative, and problem-solving; Personal - ethically minded, creative, imaginative; Professional - research-minded and socially responsible.</p>			
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	Demonstrate a broad knowledge of the scope, defining features, and main areas of the design of structural elements.
L2	Demonstrate detailed knowledge in some areas of structural element design.
L3	Understand and apply quantitative methods to reduce the embodied carbon / embodied energy in the design stage through material selection.
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 8</p> <ul style="list-style-type: none"> • Demonstrate a critical understanding of theories, principles, concepts and practice of structural element design.
Practice: Applied Knowledge and Understanding	<p>SCQF Level 8.</p> <ul style="list-style-type: none"> • Use a range of routine skills, techniques, practices and materials associated with structural element design, a few of which are complex. • Adapt routine practices with accepted design standards.

	<ul style="list-style-type: none"> • Further develop knowledge, understanding and practical engineering skills acquired through individual design work. • Understanding use and application of technical design standards and other information sources. 	
Generic Cognitive skills	SCQF Level 8 <ul style="list-style-type: none"> • Use a range of approaches to formulate evidence-based solutions to defined problems. • Be able to apply appropriate quantitative science and engineering tools to the analysis of basic problems. • Introduce the use of appropriate codes of practice and industry standards. 	
Communication, ICT and Numeracy Skills	SCQF Level 8 <p>Use a wide range of routine skills and some advance skills associated with:</p> <ul style="list-style-type: none"> • Evaluation of numerical and graphical data to measure progress and achieve goals/targets. • Conveying complex information in the form of structural design calculations to those assessing these. 	
Autonomy, Accountability and Working with others	SCQF Level 8 <ul style="list-style-type: none"> • Exercise autonomy and initiative in selecting and justifying structural design solutions. • Work in support of current professional practice of structural design, under guidance. • Develop an awareness of the framework of relevant legal requirements governing structural design, including safety and risk issues. 	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG07007	Module Title: Stress Strain & Struct Design
	Other:	
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.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	Student Learning Hours (Normally totalling 200 hours): (Note: Learning hours include both contact hours

	and hours spent on other learning activities)
Lecture/Core Content Delivery	12
Tutorial/Synchronous Support Activity	24
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:

McKenzie I. W. "Design Of Structural Elements – Part-Set Of Notes & Tutorial Problems".

Tooth, C.J. "Design of Structural Elements Notes & Tutorials". Available from VLE.

Selected Extracts from Eurocodes:- EN 1990, & Eurocodes 1, 2, 3 & 5.

Hammond, G. & Jones, C. 2011. "Inventory of Carbon & Energy (ICE) Version 2.0". University of Bath. Available from Moodle.

ISTRUCTE. 2011. "A short guide to embodied carbon in building structures". Available: <http://www.ihsti.com/tempimg/4dcefc4-CIS888614800299284.pdf>.

ISTRUCTE. 2014. "Building for a sustainable future: An engineer's guide". Available: <http://www.ihsti.com/tempimg/12e4f0c-CIS888614800306666.pdf>.

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:

Gulvanessian, H., Calgaro, J-A., and Holicky, M., "Designers' Guide to EN1990, Eurocode: Basis of structural design", Thomas Telford Publishing.

Ozelton, E. & Baird, J. "Timber designers' manual", Oxford Blackwell Science.

McKenzie, W.M.C., "Design of Structural Timber", MacMillan.

Kermani, A. "Structural Timber Design", Blackwell.

Narayanan, R. S., & Beeby, A., "Designers' Guide to EN1992-1-1 and EN1992-1-2, Eurocode 2: Design of concrete structures. General rules and rules for buildings and structural fire design", Thomas Telford Publishing.

Narayanan, R. S., & Goodchild, C. H., "Concise Eurocode 2", published by The Concrete Centre.

Moseley, W. H., Hulse, R., & Bungey, J. H., "Reinforced Concrete Design", [r.c. design to Eurocode 2, EN1992-1-1].

ISTRUCTE, "Manual for the design of reinforced concrete building structures".

Reynolds, C.E., and Steedman, J.C., *Reinforced Concrete Designer's Handbook, Spon.

Gardner, L., & Nethercot, D. A., "Designers' Guide to EN1993-1-1, Eurocode 3: Design of steel structures general rules and rules for buildings", Thomas Telford Publishing.

Arya, C., "Design of Structural Elements", Spon.

ISTRUCTE, "Manual for the design of steelwork building structures".

MacGinley, T J., "Steel Structures – Practical Design Studies", Spon.

Steel Construction Institute, Davison, B, Owens, G.W., "Steel Designers Manual", Wiley-Blackwell.
 McKenzie, W, "Design of Structural Steelwork to BS5950 and EC2", MacMillan.
 Brohn, D., "Understanding Structural Analysis", New Paradigm, London.
 Megson, T.H.G., "Structural and stress analysis", Elsevier Butterworth-Heinemann, London.

(*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:

Attend scheduled learning activities,

Submitting module assessments.

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..

(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	A. Earij
External Examiner	M Bock
Accreditation Details	This module is accredited by Joint Board of Moderators as part of BEng (Hons) Civil Engineering and GA – BEng (Hons) Civil Engineering
Changes/Version Number	2.16 V. 2.16 Covid 19 references removed. Unseen Closed Book Class Test replaces Examination. EE changed to M. Bock. Accreditation details changed

Assessment: (also refer to Assessment Outcomes Grids below)
Assessment 1 – Unseen 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)	Learning Outcome (3)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Class test (written)	✓	✓		60	2

Component 2					
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Weighting (%) of Assessment Element	Timetabled Contact Hours

Design/ Diagram/ Drawing/ Photograph/ Sketch	✓	✓	✓	40	12
Combined Total for All Components				100%	14 hours