

Session: 2022/23

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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			
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.			
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.			
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.			
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. Due to the Covid-19 pandemic, this Module may be delivered in a 'hybrid' mode with an 'adaptive' online examination. <ul style="list-style-type: none">• If the Covid-19 restrictions are eased, the preferred mode of delivery will be the one approved by the Accrediting Body (JBM) prior to the global pandemic which is 4 face-to-face contact hours/week of key practical classes.• 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.			

Module Delivery Method

Face-To-Face	Blended	Fully Online	HybridC	HybridO	Work-based Learning
✓	✓				
<p>Face-To-Face Term used to describe the traditional classroom environment where the students and the lecturer meet synchronously in the same room for the whole provision.</p> <p>Blended A mode of delivery of a module or a programme that involves online and face-to-face delivery of learning, teaching and assessment activities, student support and feedback. A programme may be considered “blended” if it includes a combination of face-to-face, online and blended modules. If an online programme has any compulsory face-to-face and campus elements it must be described as blended with clearly articulated delivery information to manage student expectations</p> <p>Fully Online Instruction that is solely delivered by web-based or internet-based technologies. This term is used to describe the previously used terms distance learning and e learning.</p> <p>HybridC Online with mandatory face-to-face learning on Campus</p> <p>HybridO Online with optional face-to-face learning on Campus</p> <p>Work-based Learning Learning activities where the main location for the learning experience is in the workplace.</p>					

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)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
✓						
Term(s) for Module Delivery						
(Provided viable student numbers permit).						
Term 1		Term 2		Term 3		
	✓					

Learning Outcomes: (maximum of 5 statements)	
<p>On successful completion of this module the student will be able to:</p> <p>L1. Demonstrate a broad knowledge of the scope, defining features, and main areas of the design of structural elements.</p> <p>L2. Demonstrate detailed knowledge in some areas of structural element design.</p> <p>L3. Understand and apply quantitative methods to reduce the embodied carbon / embodied energy in the design stage through material selection.</p>	
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)	SCQF Level 8. • Demonstrate a critical understanding of theories, principles, concepts and practice of structural element design.
Practice: Applied Knowledge and Understanding	SCQF Level 8. • Use a range of routine skills, techniques, practices and materials associated with structural element design, a few of which are complex.

	<ul style="list-style-type: none"> • Adapt routine practices with accepted design standards. • 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. Use a wide range of routine skills and some advance skills associated with: <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: <u>Stress Strain & Struct Design</u>
	Other:	
Co-requisites	Module Code:	Module Title:

Learning and Teaching	
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
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****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 Moodle.
 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)

Engagement Requirements

In line with the Academic Engagement Procedure, Students are defined as academically engaged if they are regularly engaged with timetabled teaching sessions, course-related learning resources including those in the Library and on the relevant learning platform, and complete assessments and submit these on time. Please refer to the Academic Engagement Procedure at the following link: [Academic engagement procedure](#)

Supplemental Information

Programme Board	Engineering
Assessment Results (Pass/Fail)	No
Subject Panel	Civil Engineering and Quality Management
Moderator	A. Earij
External Examiner	E Coakley
Accreditation Details	This module is accredited by Joint Board of Moderators of the ICE, IStructE, IHE and CIHT as part of BEng (Hons) Civil Engineering.
Version Number	2.15

Assessment: (also refer to Assessment Outcomes Grids below)
Examination
Assignment
(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 Handbook.)

Assessment Outcome Grids (Footnote A.)

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

Footnotes

- A. Referred to within Assessment Section above
- B. Identified in the Learning Outcome Section above

Note(s):

1. More than one assessment method can be used to assess individual learning outcomes.
2. Schools are responsible for determining student contact hours. Please refer to University Policy on contact hours (extract contained within section 10 of the Module Descriptor guidance note).
This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

Equality and Diversity

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 additional 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.

UWS Equality and Diversity Policy (<https://www.uws.ac.uk/about-uws/uws-commitments/equality-diversity/>)

[UWS Equality and Diversity Policy](#)

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