Module Descriptor

Title	Design of Structural Elements		
Session	2025/26	**Status**	Published
Code	ENGG08011	**SCQF Level**	8
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10 (European Credit Transfer Scheme)
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	A Wrzesien		

Summary of Module

General

Loads takedown analysis of permanent and variable (imposed) characteristic loads.

Design philosophy, limit states, partial safety factors for loads and material strengths, and design load combinations for ultimate and serviceability limit states.

Sustainability - concerning 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.

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	**On-Campus**[1] ☒	**Hybrid**[2] ☐	**Online**[3] ☐	**Work -Based Learning**[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
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.
L4	N/A
L5	N/A

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:**

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Knowledge and Understanding (K and U)	**SCQF 8** • Demonstrate a critical understanding of theories, principles, concepts and practice of structural element design.
Practice: Applied Knowledge and Understanding	**SCQF 8** • 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. • Further develop knowledge, understanding and practical engineering skills acquired through individual design work. • Understanding the use and application of technical design standards and other information sources.
Generic Cognitive skills	**SCQF 8** • 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 8** Use a wide range of routine skills and some advanced skills associated with: • 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 8** Use a wide range of routine skills and some advance skills associated with: • 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.

Prerequisites	**Module Code** ENGG07007	**Module Title** Stress Strain & Struct Design
	Other	
Co-requisites	**Module Code**	**Module Title**

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** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	12
Tutorial / Synchronous Support Activity	24
Practice-based Learning	12
Independent Study	152
n/a	0
n/a	0
TOTAL	200 Hours

Indicative Resources

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

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:

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in timetabled sessions. Students will scan their attendance via the attendance scanners each time they are on-campus. Students will have attendance recorded in class and they will be expected to login to the VLE several times per week. Students who are unable to attend a timetabled learning session, due to illness or other circumstance, should notify their Programme Leader. Across the School, an 80% attendance threshold is set. Students, who fall below this, will be referred to the Student Success Team to see how they can be best supported in their studies.

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.

Aligned with the University’s commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, materials will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University’s policies and regulations.

(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 Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
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
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.17

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen Closed Book Class Test (60%)
Assessment 2
Coursework (40%)
Assessment 3
N/A
(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.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed Book Class Test	☒	☒	☐	☐	☐	60	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework	☒	☒	☒	☐	☐	40	0

Component 3

Assessment Type	LO1	LO2	LO3	LO4	LO5	Weighting of Assessment Element (%)	Timetabled Contact Hours
N/A	☐	☐	☐	☐	☐		
Combined total for all components						100%	2 hours

Change Control

What	When	Who
V. 2.16 Covid 19 references removed. Unseen Closed Book Class Test replaces Examination. EE changed to M. Bock. Accreditation details changed.	10/04/2024	A Wrzesien
V. 2.17 Updated Equality and Diversity; Attendance and Engagement Requirments; assesment 2 timetabled contact hours.	20/03/2025	A Wrzesien