Module Descriptor

Title	Stress Strain & Structural Design		
Session	2025/26	**Status**	Published
Code	ENGG07007	**SCQF Level**	7
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	S Paudel		

Summary of Module

Strength of Materials

Stress, Strain, Hooke's Law, Young's modulus of elasticity, Poisson's Ratio.

Member cross-section properties.

Theory of bending, bending stresses, shear stresses.

Couples, force-couple resultant.

Combined direct (axial) and bending stresses, overturning.

Structural Steelwork Design

Structural design: objective, process.

Introduction to philosophy: limit states, partial factors.

Steel design to EN1993: steel grades, trusses and lattice girders, member cross-section types, actions.

Plate and angle tension members: effects of end-connections, axial resistance capacities.

Plate and angle compression members: effects of end-connections, local buckling, overall buckling, axial resistance capacities.

Axial resistance capacities of non-preloaded bolted connections in bearing and shear.

Axial resistance capacities of fillet-welded connections.

This module will support students to develop following UWS graduate attributes: Academic - critical and analytical thinking, knowledgeable, digitally literate, and problem solving; Personal - ethically minded, effective communicator, creative, imaginative; Professional - collaborative, 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	Summarize and apply the basic principles of strength of materials.
L2	Design, in structural steelwork, simple tension members and compression members and their connections in accordance with relevant clauses of the Eurocode standards EN1993-1-1 and EN1993-1-8.
L3	N/A
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:**
Knowledge and Understanding (K and U)	**SCQF 7** SCQF Level 7 • Demonstrate and work with a broad K & U of strength of materials and steel work design • Demonstrate K & U of the underpinning mathematics, science, and engineering mechanics to support application of key engineering principles and methods • Characteristics of linearly elastic materials, and of properties of common cross-sectional shapes, and of critical stresses and stress resultants, and of structural steelwork

[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

	• Introduction to the characteristics of the structural design process, and specifically that of structural steelwork in the context of using Eurocodes EN1993-1-1 & EN1993-1-8
Practice: Applied Knowledge and Understanding	**SCQF 7** Use some of the basic and routine professional skills, techniques, and practices of these component areas of strength of materials and steelwork design • Practice of working with, and use of, Eurocodes EN1993-1-1 and EN1993-1-8 for structural steelwork design • Develop knowledge, understanding and practical engineering skills acquired through activities carried out in an engineering laboratory •Develop practical engineering skills acquired through individual and group project work
Generic Cognitive skills	**SCQF 7** Develop the ability to apply appropriate quantitative mathematics, science and engineering tools to the analysis and solution of engineering design and analysis problems • Commence the development of transferable or meta-skills in the use of analysis and design in structural engineering
Communication, ICT and Numeracy Skills	**SCQF 7** Use a wide range of routine skills and some advance skills associated with: • Numeracy skills • Competent production and presentation of a report on a laboratory experiment and of each of two design coursework • Skills of organization, communication, and use of judgement, in the course of achieving design goals within a team working environment
Autonomy, Accountability and Working with Others	**SCQF 7** Exercise some initiative and independence in carrying out defined activities at a professional level, including: • Responsibility for the competent production and timely submission of a report on a laboratory experiment, and tasks on structural steelwork design • Work in support of current professional practice of structural design, under guidance • Progress the development of skills in planning self-learning and improving performance, as a foundation for lifelong learning/CPD

Prerequisites	**Module Code**	**Module Title**
	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.

The learning and teaching activity for this module includes lectures and tutorials, lab exercises and independent study. Independent study includes all study, learning, and processing undertaken by a student, outside of the scheduled lectures and tutorials.

In this module, formative assessment and feedback is mainly done through formal Tutorial sessions, in which the students attempt specified Tutorial Questions. Students are given support and guidance, when requested. Formative feedback is also given when coursework report is marked and returned; and students can learn and enhance their performance through reflecting on the feedback

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	24
Tutorial / Synchronous Support Activity	12
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152
n/a	0
n/a	0
TOTAL	200

Indicative Resources

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

McKenzie, I., "Stress & Strain" – Notes with Tutorial Problems will be downloadable from VLE.

McKenzie, I, "Structural Design" – Notes with Tutorial Problems, will be downloadable from module VLE. A set of Tutorial Problems will be given out in class.

Selected Eurocodes EN1990, 1991 and 1993 (Parts 1 & 8) will be downloadable via online database - British Standards Online.

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., & Holicky, M. (2002). Designers' Guide to EN1990, Eurocode: Basis of structural design. London: Thomas Telford Publishing.

Gardner, L. and Nethercot, D. A. (2005). Designers' Guide to EN1993-1-1, Eurocode 3: Design of steel structures general rules and rules for buildings. London: Thomas Telford Publishing.

Montague, P. and Taylor, R. (1989). Structural Engineering: for first year students. London: McGraw Hill.

Case, J., Chilver, H. Sir. & Ross, C. T. F. (1999). Strength of Materials and Structures. London: Arnold.

McKenzie, W. M. C. (2004). Design of Structural Elements. Basingstoke: Palgrave Macmillan.

Megson, T.H.G. (2019). Structural and Stress Analysis. Oxford: Elsevier Butterworth-Heinemann.
(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, material 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 students 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	Djamalddine Boumezerane
External Examiner	Marina Bock

Accreditation Details	This module is accredited by the Joint Board of Moderators as part of BEng (Hons) Civil Engineering.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.14 - Laboratory element introduced and module contact hours updated. Previous changes: 2.13 March 2023 - Assessment Changed to Unseen Closed Book Class Test. March 2019 - Name of the Module Coordinator changed and recommended resources added.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen Closed Book Class Test (60%)
Assessment 2
Assignment (40%) inc. laboratory
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**
Laboratory report/Coursework /Design assignment	☒	☒	☐	☐	☐	40	12

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**

N/A	☐	☐	☐	☐	☐	0	0
Combined total for all components						100%	14 hours

Change Control

What	**When**	**Who**
Further guidance on aggregate regulation and application when completing template	16/01/2020	H McLean
Updated contact hours	14/09/2021	H McLean
Updated Student Attendance and Engagement Procedure Updated UWS Equality, Diversity and Human Rights Code	19/10/2023	C Winter
Guidance Note 23-24 provided General housekeeping to text across sections.	12/12/2023	D Taylor