

University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Stress Strain & Structural Design			
Code: ENGG07007	SCQF Level: 7 (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:	Shakun Paudel		
Summary of Module			
<p>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.</p> <p>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.</p> <p>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.</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		Term 2		Term 3	
	<input type="checkbox"/>		<input checked="" type="checkbox"/>		<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	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.
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 7</p> <ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • Characteristics of linearly elastic materials, and of properties of common cross-sectional shapes, and of critical stresses and stress resultants, and of structural steelwork. • 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	<p>SCQF Level 7</p> <ul style="list-style-type: none"> • 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	<p>SCQF Level 7</p> <ul style="list-style-type: none"> • 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	<p>SCQF Level 7</p> <p>Use a wide range of routine skills and some advance skills associated with:</p> <ul style="list-style-type: none"> • 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	<p>SCQF Level 7</p> <p>Exercise some initiative and independence in carrying out defined activities at a professional level, including:</p> <ul style="list-style-type: none"> • Responsibility for the competent production and timely submission of: <ul style="list-style-type: none"> - 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.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	Module Title:
	Other:	
Co-requisites	Module Code:	Module Title:

*Indicates that module descriptor is not published.

Learning and Teaching	
<p>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.</p> <p>In this module, formative assessment and feedback is mainly done through formal Tutorial sessions, in which the students attempt specified Tutorial Questions. The students are given support and guidance, when requested. Formative feedback is also given when coursework reports is marked and returned; and the students can learn and enhance their performance through reflecting on that feedback.</p>	
<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
<p>**Indicative Resources: (eg. Core text, journals, internet access)</p>	

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., and Holicky, M., "Designers' Guide to EN1990, Eurocode: Basis of structural design", Thomas Telford Publishing.

Gardner, L., and Nethercot, D. A., *Designers' Guide to EN1993-1-1, Eurocode 3: Design of steel structures general rules and rules for buildings*, Thomas Telford Publishing. Montague, P. and Taylor, R., "Structural Engineering", McGraw Hill.

Case, J., Lord Chilver, & Ross, C. T. F. 1999. *Strength of Materials and Structures*, London, Sydney, Auckland, Arnold.

McKenzie, W. M. C. 2004. *Design of structural elements.*, Basingstoke, New York, Palgrave Macmillan

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:

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	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.
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

(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
Class Test (written)	✓	✓	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	12
Combined Total for All Components			100%	14 hours