

University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Structural Engineering 3			
Code: ENGG10013	SCQF Level: 10 (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			
<u>Indeterminate Structural Analysis</u>			
Moment Distribution Method: settlement of supports, frames with general sway, Naylor's Method for symmetrical frames with sway, elements with varying second moment of area, Slope Deflection Equations.			
<u>Plastic Design and Analysis</u>			
Member cross-sections – stages from elastic to plastic, plastic properties, fully-plastic moment of resistance. Single-span beams and continuous (multi-span) beams by the graphical method. Frames with sway by the virtual work method. Members with different relative values of M_p .			
<u>Composite Structural Members</u>			
Composite bars and beams (timber/steel). Composite beams (steel) and slabs (concrete); shear studs, metal decking, propped construction.			
<u>Reinforced Concrete Design to BS EN1992-1-1</u>			
Flanged beams. Two-way spanning slabs. Retaining walls: gravity (unreinforced); cantilever, counterfort (or buttressed). Introduction to wind loading as per BS EN1991-1-4.			
<u>Structural Steelwork Design</u>			
Single-storey buildings: portal frames, loading types. Erection of single-storey building structures.			
<u>Building Structure Design</u>			
Basic conceptual design, including the choice of structural material and means of stability provision; design Calculations for main structural elements; preparation of structural layout and detail drawings.			

Temporary Works Design

Temporary works design: falsework structures, foundations, and safety. Loads on falsework: imposed, dead and wind.

Design of falsework systems using scaffolding tube and timber formwork.

General

Sustainability with reference to material selection and structural design.

This Module aims at supporting students in developing their UWS graduate attributes, namely: Academic (critical and analytical thinking, inquiring, knowledgeable, innovation, and problem-solving); Personal (effective communicator, creative, imaginative); Professional (Collaborative, research-minded, and socially responsible).

In line with the UWS Curriculum Framework, this module is delivered in a 'hybrid' mode with 3 hours per week of on-campus practical tutorials designed for interactive and applied learning, and an online open-book examination.

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 checked="" type="checkbox"/>	<input 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	Analyse structural beams, frames and slabs by a range of methods; design reinforced-concrete beams, slabs and walls by a range of methods; and carry out the analysis and design of temporary works used on construction sites.
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L2	Plan and carry out the integrated design of a building, including the production of justification calculations and drawings, using computer programmes to facilitate the processes of design and analysis and the production of design drawings.
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 10</p> <ul style="list-style-type: none"> • Demonstrate and work with knowledge and understanding that covers and integrates most of the principal areas, features and boundaries, terminology and conventions of these key component areas of structural analysis and design. • Further develop critical knowledge and understanding of essential facts, concepts, theories and principles in structural analysis and in the structural design areas of reinforced concrete, structural steelwork, and temporary works. • Further develop knowledge and understanding of some more advanced aspects of structural engineering. • Further develop knowledge and understanding of characteristics of reinforced concrete and steelwork as materials and of temporary works materials and design. • Further develop knowledge and understanding of the characteristics of the structural design process, specifically, those of reinforced concrete in the context of using Eurocode Standard BS EN1992-1 (reinforced concrete).
Practice: Applied Knowledge and Understanding	<p>SCQF Level 10</p> <ul style="list-style-type: none"> • Use a range of the principal skills, practices and/or materials associated with these key component areas of structural analysis and design. • Use a few skills, practices and/or materials which are specialized and advanced in these areas. • Execute a defined project of structural engineering design and analysis, through a series of integrated coursework, identifying and implementing relevant design solutions and detailed outcomes, in accordance with the relevant professional codes of practice, aided by use of computer software in design and analysis. • Further develop the practice of working with, and use of, Eurocode Standard BS EN1992-1(reinforced concrete).
Generic Cognitive skills	<p>SCQF Level 10</p> <ul style="list-style-type: none"> • Critically identify, define, conceptualise and analyse complex professional level problems and issues. • Critically review and consolidate knowledge, skills and practices and thinking in these key component areas of structural analysis and design. • Further develop the ability to comprehend the broad picture and thus work with an appropriate level of detail.

	<ul style="list-style-type: none"> Further the development of transferable or meta-abilities to learn (knowledge & understanding) and to practice techniques and skills in these key component areas of structural engineering analysis and design; and in relation to structural design, to do so in compliance with the requirements of BS EN1992-1. 		
Communication, ICT and Numeracy Skills	<p>SCQF Level 10</p> <p>Use a wide range of routine skills and some advanced and specialised skills in support of established practices in these key component areas of structural analysis and design, including:</p> <ul style="list-style-type: none"> Communication with professionally qualified academic staff. Ability to use a range of computer software programmes to facilitate the solution of structural engineering design and analysis problems, and to enhance design work at this level. Interpret, use and evaluate a wide range of numerical and graphical data to set and achieve design and analysis goals/targets. Further develop graphical communication skills through drawings prepared as a component of a series of design coursework. 		
Autonomy, Accountability and Working with others	<p>SCQF Level 10</p> <ul style="list-style-type: none"> Further exercise autonomy and initiative in selecting and justifying structural design solutions. Progress the ability to work effectively under guidance in a peer relationship with the academic staff members who are qualified practitioners. Recognise the limits and limitations of theoretical methods of design and analysis, and of professional codes, and seek guidance where appropriate. Further develop skills in planning self-learning and improving performance, as the foundation for lifelong learning/CPD. 		
Pre-requisites:	Before undertaking this module the student should have undertaken the following:		
	<table border="1"> <tr> <td>Module Code: ENGG09013 ENGG09015</td> <td>Module Title: Structural Engineering 1 Construction & Structural Engineering 2</td> </tr> </table>	Module Code: ENGG09013 ENGG09015	Module Title: Structural Engineering 1 Construction & Structural Engineering 2
	Module Code: ENGG09013 ENGG09015	Module Title: Structural Engineering 1 Construction & Structural Engineering 2	
Other:	Appropriate knowledge of mathematics and fundamentals of structural mechanics; or equivalent to the above modules.		
Co-requisites	<table border="1"> <tr> <td>Module Code:</td> <td>Module Title:</td> </tr> </table>	Module Code:	Module Title:
Module Code:	Module Title:		

*Indicates that module descriptor is not published.

Learning and Teaching	
<p>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.</p> <p>The learning and teaching activity for this Module includes lectures, tutorials, computer labs and independent study. The latter includes all study, learning, and processing undertaken by a student, outside of the scheduled lectures and tutorials.</p> <p>Formative assessment and feedback are done mainly through (i) formal Tutorial Sessions, in which support is provided with specified Tutorial Questions, (ii) on-going Coursework Project, and (iii) any questions raised about other taught materials. This, being a Level 10 (Final Year) Module, the students are expected to work more independently and with relatively less instruction and guidance from the lecturers.</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> <p>The following materials form essential underpinning for the module content and ultimately for the learning outcomes:</p> <ul style="list-style-type: none"> • Earij, A. "Structural Analysis Notes & Tutorial Problems", the University of the West of Scotland, available on myUWS. • Wrzesien, A. "Structural Design Notes & Tutorials": available on myUWS. • Selected extracts from Eurocodes 0, 1 and 2, and information on specific National Annex rules. • SOFTWARE: Autodesk AutoCAD, Autodesk Revit, Autodesk Robot Structural Analysis, Concrete Centre Spreadsheets for Design to BS EN1992-1. • Brohn, D. (1984), "Understanding Structural Analysis", New Paradigm. • Ghali, A., Neville, A. & Brown, T. (2017), "Structural Analysis: A Unified Classical and Matrix Approach", Spon Press. • MacLeod, I. A. (2005), "Modern Structural Analysis: Modelling Process and 	

Guidance”, Thomas Telford.

- Megson, T.H.G. (1995), "Structural and Stress Analysis", Elsevier Butterworth-Heinemann.
- IStructE, “Manual for the Design of Concrete Building Structures to Eurocode 2”
- Martin, L.H., Croxton, P.C.L., and Purkiss, J.A. (2005), "Concrete Design to EN1992-1", Edward Arnold.
- Mosley, W.H., Hulse, R, and Bungey, J.H., “Reinforced Concrete Design”, Palgrave (Macmillan).
- Reynolds, C.E., and Steedman, J.C. (1997), “Reinforced Concrete Designer’s Handbook”, Spon.
- IStructE, “Standard Method of Detailing Structural Concrete - a Manual for Best Practice”.
- Steel Construction Institute, Davison, B. and Owens G.W., "Steel Designers Manual", Wiley-Blackwell.
- Montague, P. and Taylor, R. (1989), "Structural Engineering", McGraw Hill.
- Westbrook, R. (1996), "Structural Engineering Design in Practice", Longman.
- ANDREW ORTON 1998, The Way We Build Now, E & FN Spon.

Please ensure the list is kept short and current. Essential resources should be included, broader resources should be kept for module handbooks / Aula VLE.

Resources should be listed in Right Harvard referencing style or agreed professional body deviation and in alphabetical order.

(**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
Changes/Version Number	2.15

Assessment: (also refer to Assessment Outcomes Grids below)

Assessment 1 – Online Open-Book Examination (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)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Online Open-Book	✓	✓	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
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