University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Design Analysis 2			
Code: ENGG09020	**SCQF Level: 9 (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:	Dr Tony Murmu		

Summary of Module

This module will introduce students to engineering mechanics that are the basis of design and analysis of engineering components and systems. The module is divided into two main topic areas of study, mechanics of materials and dynamic/acoustic systems

Definition of the parameters associated with forced vibration systems. Experimental vibration testing concentrating on measurements taken and signal processing.

The importance of the basic theory and techniques of the two topic areas in the design and analysis of components and systems will be exemplified via the use of examples.

During the course of this module, students will develop their UWS Graduate Attributes (https://www.uws.ac.uk/current- students/your-graduate-attributes/).

Universal: Academic attributes (critical thinking and analytical & inquiring mind);

Work-Ready: Academic attributes (knowledge of advanced statics, dynamics applied to engineering design); Personal (motivated);

Successful: Academic attributes (autonomous), Personal (imaginative and resilient), Professional (Driven)

The module will be delivered via a blend of lectures, tutorials and laboratory experiments to exemplify the taught theory to the practical design of engineering components and systems.

Statically Determinate and Indeterminant deflection of beams will be addressed with the deflections and reactions evaluated using the Macaulay's Method.

Theories of failure will be introduced for ductile and brittle failure, Tresca, Von Mises and Gordon Rankine will be used to assess the load to first yield and factors of safety for engineering components.

Basic fatigue analysis will be introduced, with the SN diagram for zero mean loading and the Soderberg/modified Soderberg approach adopted for non zero mean loading conditions. The concept of endurance limits will be introduced and calculated for circular sections.

Thick cylinder theory will be presented with Lame' equations used for the design and analysis of pressurized, rotating and compound cylinder applications.

Introduce the concept of elastic stability as applied to columns. Calculate Euler critical bucking loads and compare to critical loads predicted from BS5950.

Description of transmissibility and vibration isolation and development of the theory to calculate, force transmitted to foundations, displacement, velocity and acceleration. Introduction to multi degree of freedom systems.

This module has been reviewed and updated, taking cognisance of the University's Curriculum Framework principles. Examples of this are found within the module such as active and engaging laboratory and tutorial activity, module assessment which reflects industry design activities, learning synergies across modules and levels of study, recorded lecture content supporting students to organise their own study time, the use of integrated group activities supporting learning communities and assessment of Continuing Professional Development allowing students to focus on and document their personal professional development utilising a PSRB template.

Module Delivery Method					
Face-To-Face	**Blended**	**Fully Online**	**HybridC**	**Hybrid 0**	**Work-Based Learning**
☒	☐	☐	☐	☐	☐
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:
☒	☐	☐	☐	☐	☐	

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	☒	Term 2	☐	Term 3	☐

Learning Outcomes: (maximum of 5 statements) At the end of this module the student will be able to:	
L1	Develop and describe understanding of the principles of the theories of failure, fatigue analysis, thick cylinders and static indeterminacy.
L2	Develop and describe the principles of vibration analysis for forced vibration, transmissibility, isolation and acoustic systems measurement and modeling.

L3	Identify and apply the relevant theories and formulations to analytically solve various design problems of engineering components and systems.

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 **9** A broad knowledge and understanding of the core theories, principles and concepts of mechanics of materials and dynamic systems.
Practice: Applied Knowledge and Understanding	SCQF Level **9** Use a range of theories and solution techniques for the design and analysis of components and systems Select and critically evaluate technical literature and other sources of information to solve complex problems. Use practical laboratory and workshop skills to investigate complex problems
Generic Cognitive skills	SCQF Level **9** Use a range of approaches to formulate solutions to routine engineering design problems.
Communication, ICT and Numeracy Skills	SCQF Level **9** Ability to solve and present the solution and information of a solution to an engineering design scenario. Use of standard ICT software to assist in the solving and presentation of solutions and results of a design solution.
Autonomy, Accountability and Working with others	SCQF Level **9** Identify solution routes and strategies using their own initiative and informed judgments. Contribute to a collective solution of a problem or design case scenario. Plan and record self-learning and development as the foundation for lifelong learning/CPD Where possible this will be developed from activities undertaken in a Level 8 module with synergies to the subject content. Function effectively as an individual, and as a member or leader of a team. Evaluate effectiveness of own and team performance.

	Communicate effectively on complex engineering matters with technical and non- technical audiences, evaluating the effectiveness of the methods used.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG08017	**Module Title:** Design Analysis 1
	Other:	Or equivalent
Co-requisites	**Module Code:**	**Module Title:**

*Indicates that module descriptor is not published.

Learning and Teaching	
The learning and teaching activity for this module include lectures, tutorials and problem based learning.	
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	18
Tutorial/Synchronous Support Activity	18
Laboratory`	2
Independent Study	162
	Hours Total 200

****Indicative Resources: (eg. Core text, journals, internet access)**
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: Engineering Mechanics, VOL. II, Dynamics, Meriam and Kraige Mechanics of Materials 1, Fourth Edition, E. J. Hearn Mechanics of Materials Fourth SI Edition J. M.Gere and S. P. Timoshenko Published by Stanley Thornes

G. F. C. Rogers and Y. R. Mayhew 1998 Thermodynamics and Transport Properties of Fluids (S I Units), 5th Edition, Basil Blackwell

G. F. C. Rogers and Y. R. Mayhew 1992 Engineering Thermodynamics, 4th Edition, Longman

J. F. Douglas et al, Fluid Mechanics, Prentice Hall; 5th edition, 2005

Y. A. Cengel and J. M. Cimbala, Fluid Mechanics: Fundamentals and Applications, McGraw-Hill, 2006 (3rd Floor North 620.106/CEN)

F. M. White, Fluid Mechanics with Student CD, McGraw-Hill Higher Education, 6th edition, 2006

Smith B. J., Peters R. J., Owen, S 'Acoustics and Noise Control' , 2nd Edition, Longman, ISBN 0-582-08804-6

James M. L, Smith G. M., Wolford J. C., Whaley P. W. 'Vibration of Mechanical and Structural Systems : With microcomputer applications', Harper and Row, ISBN 0-06-043261-6

(**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.

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.

(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 and Physical Sciences
Assessment Results (Pass/Fail)	Yes ☐No ☒
School Assessment Board	Engineering
Moderator	Tony Leslie
External Examiner	M Ghaleeh
Accreditation Details	This module is part of the IMechE accredited programmes BEng/MEng (Hons) Aircraft and Mechanical Engineering.
Changes/Version Number	3.17 (was 3.16) Module Delivery Changed to Face-To-Face from Hybrid C. Unseen Closed Book Class Test replaces Open Book Examination as per the intention to return to on-campus assessment. What was LO 3 “Describe the main stages of common power cycles and develop the ability to carry out numerical analysis of such cycles” deleted- The content of this LO has moved to another module ENGG08021 to balance the volume of materials in the two modules better. Assessment outcome Grids amended accordingly.

Assessment: (also refer to Assessment Outcomes Grids below)
Class Test 1 (written) - Unseen Closed Book (Class test)- 50%
Laboratory - 20%
Design Study- 20% and CPD- Log 10%
(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)**	**Learning Outcome (3)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Unseen Closed Book (Class Test)	✓	✓	✓	50	2

Component 2					
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Laboratory	✓	✓	✓	20	2

Component 3					
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	✓	✓	✓	20	0
Workbook/ Laboratory notebook/ Diary/ Training log/ Learning log	✓	✓	✓	10	0
Combined Total for All Components				**100%**	**4 hours**