Module Descriptor

Title	Design Analysis 2		
Session	2025/26	**Status**	Published
Code	ENGG09020	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	T 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.

The statically determinate and indeterminant deflection of beams will be revisited using the Macaulay's Method.

By understanding the basics of combined stresses, the 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.

The concept of elastic stability will be introduced as applied to columns. Calculate Euler critical bucking loads and use it for design of columns.

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	**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	Critically evaluate the principles of the theories of failure, fatigue analysis, thick cylinders, and buckling of columns.
L2	Analyse and describe the principles of vibration analysis for forced vibration, transmissibility, isolation and acoustic systems measurement and modeling.
L3	Apply the relevant theories and formulations to analytically solve various design problems of engineering components and systems.
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 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 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 9** Use a range of approaches to formulate solutions to routine engineering design problems.
Communication, ICT and Numeracy Skills	**SCQF 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 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.

Prerequisites	**Module Code** ENGG08017	**Module Title** Design Analysis 1
	Other or Equivalent	
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 include series of lectures, tutorials and a laboratory session.

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	18
Tutorial / Synchronous Support Activity	18
Laboratory / Practical Demonstration / Workshop	12
Personal Development Plan	18
Independent Study	134
n/a	0
TOTAL	200

Indicative Resources

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

Meriam, J. L. and Kraige, L. G. (2013) Engineering Mechanics, Vol. 2, Dynamics. 7th edn. Hoboken, N.J. : Wiley.

Hearn, E. J. (1985) Mechanics of Materials Vol 1. 2nd edn. Oxford : Pergamon Press.

Hearn, E. J. (1985) Mechanics of Materials Vol 2. 2nd edn. Oxford : Pergamon Press.

Gere, J. M. and Timoshenko, S. P. (1999) Mechanics of Materials. 4th edn. Cheltenham : Stanley Thornes.

Smith B. J., Peters R. J. and Hollins, M. (2011) Acoustics and Noise Control , 3rd edn. Harlow, Essex, England ; New York : Pearson Education.

James M. L, Smith G. M., Wolford J. C., Whaley P. W. (1989) Vibration of Mechanical and Structural Systems : With microcomputer applications. New York, N.Y. : Harper and Row.

(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, they will have their 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 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 laboratory-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	Design
Moderator	T Leslie
External Examiner	M Ghaleeh
Accreditation Details	This module is part of the IMechE accredited programmes BEng/MEng (Hons) Aircraft Engineering and BEng/MEng (Hons) Mechanical Engineering.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	3.18 (was 3.17) Module Descriptor copied to 2025/26 template, LOs resources list updated to reflect ILR feedback, Attendance and Engagement and EDI statements updated.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class Test 1 (written) - Unseen Closed Book (Class test)- 50%
Assessment 2
Laboratory - 20%
Assessment 3
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.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed Book (Class Test)	☒	☒	☒	☐	☐	50	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Laboratory	☒	☒	☐	☐	☐	20	2

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Design Study and CPD	☒	☒	☒	☐	☐	10	0
Combined total for all components						100%	4 hours

Change Control

What	**When**	**Who**
Module Descriptor copied to 2025/26 template, LOs and resources list updated to reflect ILR feedback, Attendance and Engagement and EDI statements updated.	March 2025	T. Murmu