Module Descriptor

Title	Design & Applications		
Session	2025/26	**Status**	Published
Code	ENGG09021	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Dr Tony Murmu		

Summary of Module

This module will enable the student to select and size appropriate machine components to satisfy a component or system design.

Fundamental engineering theory is used to develop expressions that describe the function and operation of the machine component enabling correct sizing to be undertaken

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 design of machine components; problem solver); Personal (motivated);

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

Scope of the module:

Straight cut spur gears, helical gears, bevel gears will be considered, expressions for speed, torque and gear tooth forces will be developed. Gear tooth stressing for straight cut spur gears. Bearing types along with their theory, applications and limitations will be introduced and discussed. Selection of suitable bearings and sizing will be undertaken for appropriate applications.

Power screws will be discussed with their theory of operation being derived, and applied to solve suitable design problems.

The design of bolted and welded connections will be considered for direct, shear, and combined loading conditions with design calculations being undertaken to determine bolt numbers, size and factors of safety.

The factors affecting shaft design will be discussed including location features, stress concentration effects, stiffness and life considerations.

Brakes and clutches will be introduced and discussed. Appropriate theory to describe their operation will be developed and applied to solve design problems. Flexible drive elements will be introduced and discussed. . Appropriate theory to describe their operation will be developed and applied to solve design problems. Flat , vee and poly-vee belts will be considered along with chain drives.

Helical extension, compression and torsional spring theory will be developed and applied to the designing of such elements.

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 and the use of integrated group activities supporting learning communities.

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	Apply comprehensive knowledge of machine components to satisfy the specification of a component or complex system
L2	Formulate and analyse complex problems to reach substantiated conclusions by using applicable theory to obtain appropriate formulae that describe the operation of the machine component.
L3	Select appropriate machine components by reviewing advantages, disadvantages and limitations of each of the machine components.
L4	Use engineering analysis and standard spread sheets for the analysis, including technical literature, selection and sizing of suitable machine components for a component or system.
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 machine component design.
Practice: Applied Knowledge and Understanding	**SCQF 9** Use a range of theories and solution techniques for the design and analysis of machine components with in system design. Design solutions for complex problems that evidence some originality and meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards Apply an integrated or systems approach to the solution of 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.

Prerequisites	**Module Code** ENGG08017	**Module Title** Design Analysis 1
	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 for this module comprises a series of lectures, tutorials and demonstration of various mechanical components.	
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
Independent Study	164
n/a	
n/a	
n/a	
TOTAL	

Indicative Resources

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

Shigley, J. E. and Mischke, C. R. (2003) Mechanical Engineering Design. 7th edn. New York, USA : McGraw-Hill Higher Education.

Juvinall, R. C and Marshek, K. M. (2021) Fundamentals of Machine Component Design, 7th edn. Hoboken, N.J. : Wiley.

Hannah, J. and Stephens R. C, (1972) Mechanics of Machines – Advanced Theory and Examples, 2nd edn. London, England : Edward Arnold.

(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	A Uzzaman
External Examiner	M Ghaleeh
Accreditation Details	This module is part of the IMechE accredited programmes BEng/Meng (Hons) Mechanical Engineering.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.13 (was 2.12)

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class Test 1 (written)- Unseen Closed Book (Class test)- 35%
Assessment 2
Class Test 2 (written)- Unseen Closed Book (Class test)- 35%
Assessment 3
Design Case Study- 30%
(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)	☒	☒	☐	☐	☐		

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

Unseen Closed Book (Class Test)	☐	☒	☒	☒	☐		

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

Change Control

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