Module Descriptor

Title	Materials, Manufacturing and CAD		
Session	2026/27	**Status**	Published
Code	ENGG08001	**SCQF Level**	8
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	B Aresh		

Summary of Module

This module integrates three foundational pillars of modern mechanical and manufacturing engineering: materials science, contemporary manufacturing, and computer-aided design (CAD). By merging the content of Materials and Contemporary Manufacturing and Computer Aided Design 1, the module provides students with a unified and coherent understanding of how materials, manufacturing processes, and digital design tools interact across the product development lifecycle.

Students begin by exploring the structure, behaviour and properties of engineering materials, with particular emphasis on steels and advanced materials used in automotive, aerospace, and high-performance applications. They will investigate how material properties can be altered through heat treatment, alloying and processing, and how these choices influence design decisions, component performance, and sustainability considerations. Students will also develop understanding of primary and secondary manufacturing processes.

Parallel to this, the module develops students' digital engineering competence through the introduction of Computer Aided Design (CAD) using an industry-standard system such as SolidWorks. Students will learn the principles of parametric modelling, feature-based design, assembly modelling, and the preparation of engineering drawings in line with industrial standards. They will also explore the role of Product Data Management (PDM) systems, secure data handling, and the wider strategic importance of digital product development in contemporary engineering practice. Through hands-on laboratory work and guided tutorials, students will apply CAD tools to represent and communicate engineering concepts accurately and professionally.

By integrating materials, manufacturing, and CAD within one learning journey, the module provides students with a holistic appreciation of how materials selection, processing decisions, and digital modelling are interconnected throughout the engineering design and production lifecycle. Practical laboratories, software-based modelling sessions, and problem-solving tutorials ensure that students develop both theoretical understanding and strong applied skills. This prepares them for more advanced engineering study and develops the essential technical and professional competencies required by industry.

Graduate Attributes:

1. Students will gain a strong understanding of engineering materials, contemporary manufacturing processes, and the role of CAD in modern product development workflows.
2. They will be able to work independently and in teams to create, analyse and communicate engineering models using industry-standard CAD tools, applying parametric modelling, assembly methods and engineering drawing standards.

3. They will develop the ability to evaluate and select appropriate materials and manufacturing processes, considering quality, sustainability, and the broader industrial context.
4. They will demonstrate competence in interpreting experimental and analytical data from materials testing and manufacturing activities, linking material behaviour and production decisions to digital models and engineering requirements.

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 a comprehensive knowledge of the structure of a variety of materials and explain how their properties may be varied though the addition of other materials or material processing. (AEHP4 Learning outcomes - C1, C4 ; M1, M4)
L2	Use practical laboratory and workshop skills to investigate heat treatments, failure types and their mechanisms. (AHEP4 Learning Outcomes- C2, C12; M2, M12)
L3	Select and apply appropriate materials, engineering technologies and processes, recognising their limitations and the environmental and societal impact of solutions (including the entire life-cycle of a product or process) and minimise adverse impacts. (AHEP4 Learning Outcomes – C5, C7; M5, M7)
L4	Demonstrate the ability to use industry-standard CAD tools to capture design requirements through parametric, feature-based modelling and create product assemblies. (AEHP4 Learning outcomes - C13; M13)
L5	Communicate effectively on complex engineering matters with technical and non-technical audiences, evaluating the effectiveness of the methods used. (AHEP4 Learning Outcome – C17; M17)

Employability Skills and Personal Development Planning (PDP) Skills

[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

SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:
Knowledge and Understanding (K and U)	**SCQF 8** Demonstrate an extended knowledge of the different types and characteristics of engineering materials Demonstrate a knowledge of primary and secondary manufacturing processes Demonstrate a knowledge of appropriate tools used to monitor and confirm quality assurance and efficiency.
Practice: Applied Knowledge and Understanding	**SCQF 8** Select appropriate materials and manufacturing methods for a range of consumer products Determine the appropriate method of manufacture for an engineering component Analyse how tolerancing affects assembly and the role quality systems have on the assurance of correct assembly. Analyse the role quality systems have on material conformity. Select and critically evaluate technical literature and other sources of information to solve complex problems.
Generic Cognitive skills	**SCQF 8** Use appropriate quantitative science and engineering tools to the analysis of basic engineering problems. Demonstrate the ability to monitor, interpret and apply the results of analysis and modelling.
Communication, ICT and Numeracy Skills	**SCQF 8** Demonstrate an understanding of the computer techniques available to enhance the communication of engineering ideas and concepts.
Autonomy, Accountability and Working with Others	**SCQF 8** Develop an enhanced level of transferable skills that will be of value in working with others in more complex situations Recognise the role and contribution of team members when carrying out and evaluating tasks.

Prerequisites	Module Code	Module Title
	Other Adequate knowledge of mathematics and fundamentals of structural mechanics	
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, laboratories (practical and software) and tutorials.

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	1
Independent Study	163
n/a	0
n/a	0
TOTAL	200

Indicative Resources

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

Various handout materials.

Ashby, M., Shercliff, H. and Cebon, D. (2019) Materials: Engineering Science Processing and Design. 4th edn. Oxford: Butterworth-Heinemann.

Elangovan, U. (2021). Industry 5.0: The Future of the Industrial Economy . 1st edn. Boca Raton: CRC Press.

Ajay, , Singh, H., Parveen, , & AlMangour, B. (Eds.). (2023). Handbook of Smart Manufacturing: Forecasting the Future of Industry 4.0. 1st edn. Boca Raton: CRC Press.

Callister, W.D. and Rethwisch, D.G. (2020) Callister's Materials Science and Engineering. 10th edn. Oxford: Wiley.

Hardware/Software: SolidWorks software + 40 seat PC Lab with corresponding network facilities and suitable PCs. Software site licences required.

Chang, K.-H. (2015) e-Design. Elsevier. Available at: https://doi.org/10.1016/C2009-0-63076-2.

Planchard, D.C. (2022) Engineering Design with SOLIDWORKS 2022: A Step-by-Step Project Based Approach Utilizing 3D Solid Modeling. SDC Publications. Available at: https://www.sdcpublications.com/Textbooks/Engineering-Design-SOLIDWORKS-2022/ISBN/978-1-63057-468-0/ (Accessed: 24 March 2025).

Schilling, P.J. and Shih, R.H. (2022) Parametric Modeling with SOLIDWORKS 2022. SDC Publications. Available at: https://www.sdcpublications.com/Textbooks/Parametric-Modeling-SOLIDWORKS-2022/ISBN/978-1-63057-463-5/ (Accessed: 24 March 2025).

Tony Liu, D. and William Xu, X. (2001) 'A review of web-based product data management systems', Computers in Industry, 44(3), pp. 251–262. Available at: https://doi.org/10.1016/S0166-3615(01)00072-0.

(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 lab-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	P Vichare
External Examiner	B Bryant
Accreditation Details	This module is accredited by IMechE as part of MEng/BEng (Hons) Mechanical Engineering and MEng/BEng (Hons) Aircraft Engineering programmes.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.21 Typo correction: Module co-ordinator- B Aresh

	Term 2 and not Term 1 Assessment 3 category included. 2.20 Module Title changed to 'Materials, Manufacturing and CAD' Module Descriptor updated to reflect the integration of Materials and Contemporary Manufacturing and Computer Aided Design 1. AHEP4 Learning Outcomes included in LO section. Updated resource list. 2.19 Module Descriptor copied to 2025/26 template, Attendance and Engagement and EDI statements updated. Delivery Term changed to T1 from T2.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Assessment Category 1: Class Test (Unseen, Closed Book), Weight – 35%
Assessment 2
Assessment Category 2: Laboratory - 30%
Assessment 3
Assessment Category 3: 3D Modelling (Practical – Class test) - 35%
(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)	☒	☒	☒	☒	☐	35	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Laboratory/ Practical Demonstration/Workshop	☐	☒	☐	☐	☒	30	1

Component 3

Assessment Type	LO1	LO2	LO3	LO4	LO5	Weighting of Assessment Element (%)	Timetabled Contact Hours
3D Modelling (Practical – Class test)	☐	☐	☐	☒	☒	35	2
Combined total for all components						100%	5 hours

Change Control

What	When	Who
Typo: Module co-ordinator- B Aresh Term 2 and not Term 1 Assessment 3 category included.	March 2026	B Aresh
Module Descriptor updated to reflect the inclusion of CAD component. Module Title updated. AHEP4 Learning Outcomes included in LO section. Resouruces updated. A third assessment included with a total of 35, 30 and 35% split	March 2026	A. Uzzaman
Module Descriptor copied to 2025/26 template, Attendance and Engagement and EDI statements updated. Delivery Term changed to T1 from T2.	March 2025	A. Uzzaman