Module Descriptor

Title	Advanced Computer Aided Design		
Session	2026/27	**Status**	Published
Code	ENGG09057	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	Dr Parag Vichare		

Summary of Module

Product development, regardless of application area, involves configuring, organising, structuring, storing, and tracking the product data created by a design and development team. Today products are designed independently as well as collaboratively using global supply chain which may involve the use of advanced 3D computer aided modelling packages for managing design complexity.

This module extends the use of Solidworks package, allowing students to gain experience/knowledge of constructing, modifying and constraining 3d wireframes for configuring surface based geometry for capturing product specifications and requirements. Smart-design and productivity techniques used for complex assembly designs will be introduced. Kinematic mechanisms and simulations will be configured for building Digital Mock-ups. Mixed-reality techniques, Analysis tools and feasibility/optimisation methods currently used within the design process will be utilised.

During the course of this module students will develop their UWS Graduate Attributes. Academic Work-ready attributes: Knowledgeable and understanding of computer aided design methods and techniques for product development.

This module has been reviewed and updated, taking cognisance of the University's Curriculum Framework principles. For example, module will be delivered mainly by an innovative laboratory demonstrations, recorded lecture content supporting students to organise their own study time and the use of real-world practical problems, industry standard Computer Aided Engineering activities developing digital intelligence meta-skills.

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	Demonstrate smart-design and productivity techniques for configuring complex design scenarios (AHEP4 Learning Outcome C3/C12; M3/M12).
L2	Apply wireframe and surface modelling tools to capture design requirements and to configure/edit a product geometry (AHEP4 Learning Outcome C3/C12; M3/M12).
L3	Generate advanced assembly modelling and management techniques to create complex product assemblies (AHEP4 Learning Outcome C3/C4/C5/C10/C12; M3/M4/M5/M10/M12).
L4	Design and develop kinematic mechanisms and demonstrate an ability to use analysis tool for feasibility/optimisation study (AHEP4 Learning Outcome C3/C6/C12; M3/M6/M12).
L5	Demonstrate the use Mixed-reality techniques for collaborative product design/review process (AHEP4 Learning Outcome C3/C4/C5/C12; M3/M4/M5/M12).

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 9** A specialised knowledge and understanding of computer aided design (CAD) methods and techniques and how these fit into engineering and design strategies. A critical knowledge and understanding of the application, techniques and practices associated with CAD in the engineering and design environment.

[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

	To gain specific knowledge of the appropriateness of methods and techniques for different CAD related problems/scenarios. Knowledge and understanding of health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards when undertaking and evaluating design activity. Understanding of mitigation of security risks in relation to accessing and storing data and digital equipment.
Practice: Applied Knowledge and Understanding	**SCQF 9** Applying knowledge and understanding to develop solid and surface modelling solutions for a range of mechanical and aircraft engineering problems. Assessing and analysing different design options with respect to obtaining a suitable design solution. Making use of specialised 3D modelling techniques to produce efficient design solutions. Making use of Kinematic techniques to confirm range of movement of a design. Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed. Select and critically evaluate technical literature and other sources of information to solve complex problems. 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** Undertaking, evaluating and assessing critical CAD methods. Making judgements on appropriateness of CAD solution strategies. Being able to develop conceptual solutions and strategies to CAD related problems and activities. Critically discuss solution strategies and issues associated with CAD techniques. Bringing information together from a variety of sources during problem solving and being able to perceive potential problems with methods and strategies. Formulate and analyse complex design problems to reach substantiated conclusions using CAD systems.
Communication, ICT and Numeracy Skills	**SCQF 9** Ability to perform, interpret and evaluate complex numerical, geometrical and graphical data and using it to solve problems. Ability to use variables and equations. Ability to integrate existing software with other applications such as spread sheets. Make use of multi-purpose integrated software systems to solve or provide solutions to complex CAD related activities.

	Using communications skills to write detailed, technical reports, including text and illustration. Communicate using CAD systems through animated sequences and other standard presentation media. Using CAD hardware and software and associated ICT equipment and systems such as networks to support and perform a wide range of problem solving and CAD related tasks. Communicate effectively on complex engineering matters with technical and non-technical audiences using CAD and mixed-reality tools
Autonomy, Accountability and Working with Others	**SCQF 9** Identifying and addressing their own learning needs both during and out with class time. Identifying solution routes and strategies using their own initiative and informed judgements.

Prerequisites	**Module Code** ENGG09056	**Module Title** Computer Aided Design 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. This module will be delivered via a blend of online pre-recorded lectures and classroom tutorial. A range of formative video tutorials will ensure engagement on all topic areas with video recordings of the software for support out of class. Use of discussion forums will be encouraged. Assessment will be via a coursework utilising access to CAD/CAM (or equivalent) software.	
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	12
Tutorial / Synchronous Support Activity	24
Independent Study	164
n/a	0
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:

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

Tran, P., SOLIDWORKS 2022 Intermediate Skills: Expanding on Solids, Surfaces, Multibodies, Configurations, Drawings, Sheet Metal and Assemblies. 2021: SDC Publications.

Tran, L., Mastering Surface Modeling with SOLIDWORKS 2022: Basic through Advanced Techniques. 2021: SDC Publications. Chang, K.H., E-Design: Computer-aided Engineering Design. 2015: Academic Press.

Chang, K.H., Motion Simulation and Mechanism Design with SOLIDWORKS Motion 2021. 2021: SDC Publications (Schroff Development Corporation).

(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	B Aresh
External Examiner	B Bryant
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	Module Descriptor copied to 2025/26 template and resources list updated to reflect ILR feedback, Attendance, Engagement and EDI statements updated.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Class test (practical)
Assessment 2
Essay: Coursework
Assessment 3
(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**
Class test (practical)	☒	☒	☐	☐	☐	30	2

Component 2

Assessment Type	LO1	LO2	LO3	LO4	LO5	Weighting of Assessment Element (%)	Timetabled Contact Hours
Essay	☐	☒	☒	☒	☒	70	0

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
	☐	☐	☐	☐	☐		
Combined total for all components						100%	2 hours

Change Control

What	When	Who
Module Descriptor copied to 2025/26 template and resources list updated to reflect ILR feedback, Attendance, Engagement and EDI statements updated.	26/03/2025	P Vichare
Module title is changed from CAD 2 to ACAD. AHEP4 map added in LOs.	14/03/26	P Vichare