Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG5C3
Module Title	Design to Manufacture CAD CAM
Level	5
Credit value	20
Faculty	FACE
HECoS Code	100160
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
FdEng Industrial Engineering (Mechanical) BEng (Hons) Mechanical Engineering with Manufacture BEng (Hons) Aerospace Engineering BEng (Hons) Mechanical Engineering BEng (Hons) Motorsport Engineering	Core

Breakdown of module hours

Learning and teaching hours	0 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	36 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**36 hrs**
Placement hours	0 hrs
Guided independent study hours	164 hrs
Module duration (Total hours)	**200 hrs**

Module aims

This module provides an immersive, practice-driven learning experience where students apply theoretical understanding through continuous experimentation and reflection. Activities

promote independence, problem definition, and solution generation. Learners refine their technical accuracy, teamwork, and decision-making skills to professional standards expected at this stage of study.

This module aims to develop students' practical and theoretical understanding of Computer-Aided Manufacturing (CAM) within an industrial engineering context. Students will design, manufacture, and reverse-engineer components using industry-standard CAD/CAM workflows.

The module provides hands-on experience with CNC machining, additive manufacturing (3D printing), and 3D scanning technologies that are widely used in modern manufacturing environments.

Emphasis is placed on the selection and justification of appropriate manufacturing processes for specific engineering applications, taking into account material properties, dimensional tolerances, production efficiency, cost considerations, and quality standards.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Apply Computer Aided Manufacturing (CAM) principles to develop and fabricate a solution for a broadly defined engineering problem, using CAD data in accordance with industrial practice (AHEP-4 F12).
2	Analyse engineering designs using CAM technologies to manufacture, replicate, and reverse engineer components, addressing issues related to tolerances, accuracy, and manufacturing constraints.
3	Evaluate and justify the selection of appropriate manufacturing processes and technologies for specific engineering applications, considering materials, tooling, production efficiency, cost, quality standards, and sustainability (AHEP-4 F13).

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1: Portfolio

Students undertake a comprehensive analysis of a selected engineering component, applying CAD/CAM principles and digital manufacturing technologies to evaluate and optimise its production.

This involves assessing the component's suitability for CNC processing and/or additive manufacturing, developing appropriate toolpaths or print strategies, and selecting suitable materials and tooling. Consideration is given to key industrial factors including production efficiency, cost, quality, and sustainability.

In addition, students investigate the use of 3D scanning technologies for CAD model regeneration and workflow optimisation within modern manufacturing processes.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Portfolio	3000	100	N/A

Derogations

Credits shall be awarded by an Assessment Board for those modules in which a pass mark 40% has been achieved, with a minimum mark of 30% in each assessment element.

Learning and Teaching Strategies

Teaching and learning emphasises hands-on learning through sustained practical activity, supported by targeted online instruction and feedback. Students design and carry out applied tasks that demand accuracy, teamwork, and independent thinking. Virtual resources and recordings enable continued reflection, while tutorials provide opportunities for constructive dialogue and refinement of professional practice.

Welsh Elements

This module will be delivered through the medium of English; however, students have the option to submit their assessments in the medium of Welsh. While this module is not currently offered fully through Welsh, Welsh language support and guidance are available, and some learning materials or tutorial discussions may incorporate Welsh elements where appropriate. To further promote bilingual learning, all students have the opportunity to take the 20-credit *Welsh for STEM* short course, designed to develop confidence and subject-specific language skills in both English and Welsh.

Indicative Syllabus Outline

Introduction to CAD and CAM Technologies: Overview of CNC and CAM systems used in industrial practice, focusing on digital workflows that link design data to CNC machining and additive manufacturing processes.

CAM Strategy Development from CAD Models: Generation and validation of CAM strategies, including toolpath creation and additive manufacturing build strategies, using industry standard software and practices.

3D Scanning and Reverse Engineering: Application of 3D scanning and reverse engineering techniques to recreate, analyse, and optimise CAD models for manufacturing and replication.

Design Evaluation for Manufacturability: Analysis of engineering designs using CAM technologies, addressing issues of tolerances, accuracy, geometric constraints, and suitability for CNC processing and additive manufacturing.

Material, Tooling, and Process Selection: Selection and evaluation of appropriate materials, tooling, and manufacturing processes for industrial applications, informed by design requirements and manufacturing constraints.

Justification of Manufacturing Decisions: Critical justification of manufacturing approaches, considering production efficiency, cost, quality standards, and sustainability within an industrial engineering context.

Indicative Bibliography

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads:

B. Redwood, *The 3D Printing Handbook: Technologies, Design and Application*. Amsterdam, The Netherlands: 3D Hubs B.V., 2017

Other indicative reading:

Stephenson, D. A. & Agapiou, J. S. (2019) *Metal Cutting Theory and Practice*. 3rd ed. Boca Raton, FL: CRC Press.

Bi, Z. & Wang, X. (2020) *Computer aided design and manufacturing*. 1st edition. Hoboken, New Jersey ; Wiley.

Administrative Information

For office use only	
Initial approval date	June 2026
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