Module specification

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Module Code	ENG5A6
Module Title	Computer Aided Manufacturing
Level	5
Credit value	20
Faculty	FAST
HECoS Code	100202
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng (Hons) Aeronautical and Mechanical Engineering MEng Aeronautical and Mechanical Engineering	Core
BEng (Hons) Automotive Engineering MEng Automotive Engineering	Core
BEng (Hons) Mechanical Engineering MEng Mechanical Engineering	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	12 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	24 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**36** hrs
Placement / work based learning	0 hrs
Guided independent study	170 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	22/08/2022
With effect from date	September 2022
Date and details of revision	
Version number	1

Module aims

This module aims at:

- Developing the student's understanding of Computer Aided Manufacturing (CAM) engineering.
- Giving opportunities to produce/replicate/reverse simple parts.
- Using CNC and 3D printing manufacturing techniques.
- Learning how to determine where the most appropriate manufacturing process is for a given application/design.

Module Learning Outcomes

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

1	Select, develop a strategy, and perform simple 3D scanning operations
2	Identify and discuss the advantages and drawback of the majority of the common CAM processes (CNC, 3D print) in any given context
3	Evaluate and suggest modifications to any design for CAM production
4	Select, develop a strategy, and perform CAM operations.

Assessment

Indicative Assessment Tasks:

A portfolio of practical work evidence for a given scenario (ie: Scan, redesign, manufacturing evaluation(s) and critical analysis of the performance) that includes a demonstration of the learner's competence in the use of modern commercial computer software and its willingness to learn and develop of new skills. Quality management systems will be assessed using compliance against international standards

The portfolio should have a word count of 4000 or equivalent.

More details will be made available in the relevant academic year module handbook.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1, 2, 3, 4	Portfolio	100%

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Learning and Teaching Strategies

The module will be introduced to students through a limited series of lectures underpinned by several practical opportunities. Various exercises assisted by notes via the University's VLE platform will be proposed to the learners.
Lectures will deliver key concepts, ideas, theories and examples. Demonstrations and practical exercises will also be arranged to show the operation and set up of certain processes. It will give students the opportunity to investigate subject specific knowledge through individual work. Relevant videos will be used to aid the learning process.

Indicative Syllabus Outline

3D Scanning technology:
Contact and non-contact scanners.
Calibration and accuracy.
Data collection and processing.
Density and resolution of points clouds.
Scan registration and mesh generation (Geomagic Wrap, Mesh Lab, or other).
Reverse engineering software for creation of .stl file ready for reverse engineering.

Rapid prototyping technology:
3D printing technologies.
Materials for additive manufacture.
Benefits and limitations of existing technologies.
Design advice and guidelines.
CURA software for RP simulation.

CNC machining technology:
Process kinematics of metal cutting process.
Stock determination and clamping techniques.
Cutting tools selection in relation to operation.
Cutting conditions: depth, feed, speed.
Cutting forces, vibration and cutting temperatures.
Quality of the machining surfaces, cutting process optimisation.
Path creation and simulation: CNC Code generation from CAM software (SolidWorks/Fusion360).

Quality management and compliance in machining

Indicative Bibliography:

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

Essential Reads

G. Confalone, et al., 3D Scanning: Metrology for Advanced Manufacturing (Additive Manufacturing Skills in Practice). John Willey & Sons, 2022.
B. Redwood, The 3D Printing Handbook: Technologies, design and application., 3D Hubs B.V., 2017.

Other indicative reading

P. De Vos, Applied Metal Cutting Physics – Best Practice. Elanders, (www.secotools.com), 2016.
T. Chang, et al., Computer-Aided Manufacturing, 3rd ed. Prentice-Hall, 2005.
Websites:

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes
Engaged
Creative
Ethical

Key Attitudes
Commitment
Curiosity
Resilience
Confidence

Practical Skillsets
Digital Fluency
Critical Thinking
Communication