Module specification

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Module Code	ENG5AB
Module Title	Computer Aided Engineering
Level	5
Credit value	20
Faculty	FAST
HECoS Code	M Jones
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng (Hons) Industrial Engineering Design (Mechanical)	Core
FdEng Industrial Engineering (Mechanical)	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	40 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	0 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**40** hrs
Placement / work based learning	0 hrs
Guided independent study	160 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	11/09/2019
With effect from date	11/09/2019
Date and details of revision	30/01/20 Admin update of derogation

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	Approved on 21/09/20 for addition of BEng Low Carbon Energy, Efficiency and Sustainability Oct 22 minor modification to LO wording through the revalidation and template update Sept 22 addition of FdEng Industrial Engineering (Mechanical)
Version number	4

Module aims

This module aims to develop the student's understanding of the Computer Aided Engineering and strengthen their skills in Computer Aided Design. Opportunities to undertake simple finite element analysis will be given and students will be required to validate any task they undertake using FEA. 3D printing and additive manufacturing techniques will be introduced and students will be required to ascertain where the most appropriate Additive Manufacturing process for a given application.

Module Learning Outcomes - at the end of this module, students will be able to:

1	Demonstrate a conceptual understanding of a Finite Element Analysis task using an industry standard CAD package
2	Evaluate a design for CNC machining and create a suitable tool path.
3	Demonstrate the suitability of the existing CAE processes with particular reference to 3D printing technologies.
4	Evaluate the current benefits and limitations of additive manufacturing for industrial application

In addition to the module learning outcomes, students will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: C3 for BEng Industrial Engineering Design (Mechanical) and F3 for FdEng Industrial Engineering (Mechanical).

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 One: An in-class multi-choice assessment that used a solid CAD model to undertake a FEA task with the results being selected using a Moodle quiz.

Assessment Two: An industry led piece of course work where the student identifies suitable components, either in their place of work or through research which would be suited to subtractive and additive manufacturing technologies

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1	In-class test	50

2	2,3,4	Coursework	50

Derogations

A derogation from regulations has been approved for this module 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 presented to students through lectures, tutorials and practically-based assignments. Half of the time will be devoted to practical investigations and will include the use of computer simulation software.

The tutorials will be used for students to practice problem solving to reinforce the lecture material and to provide individual attention where needed.

Indicative Syllabus Outline

CAD and Engineering Drawings

- Apply dimensional tolerances to engineering drawings,
- Communication of ideas including drawings, solid and assembly modelling, including standardisation of detail,
- Creation of engineering drawing to industry standards
- Apply design for manufacture/construction/maintenance principles to the development of computer aided engineering models
- Evaluate the features of a design optimisation and maturity model and how this aids design capability improvement

Finite Element Analysis

- Where is it used and applicable?
- Simple static models using CAD software
- Importance of validating FEA models
- Understand applications and limitations of FEA

CNC machining

- CAD to CNC software conversion
- Solid model generation
- 3D CNC capability
- Selection of tool paths and opportunities.
- Understand the limitations and applications of CNC machining

3D Prototyping

- Where is 3D printing suitable for a business and technology perspective?
- Different material technologies associated with additive manufacture
- The integration of 3D scanning technology and reverse engineering

- Generate STL files from solid 3D CAD solid models and prepare these for the selected additive manufacturing process. Manufacture components using additive manufacturing methods

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update. Please *ensure correct referencing format is being followed as per University Harvard Referencing Guidance.*

Essential Reads

N. Brock, *Cad Cam Rapid Prototyping Application Evaluation,* CreateSpace Independent Publishing, 2016.

Other indicative reading

R. A. Lavala, *CAD/CAM: Concepts and Applications*, PHI Learning, 2013.

T. Chang, et al., Computer-Aided Manufacturing, 3rd ed. London: Prentice-Hall, 2005.

Inventor online tutorials and workpath

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
Enterprising
Creative
Ethical

Key Attitudes
Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Leadership and Team working
Critical Thinking
Emotional Intelligence
Communication