

Module specification

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Module Code	ENG6B6
Module Title	Manufacturing Systems and Sustainable Engineering
Level	6
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) Mechanical Engineering	Optional

Pre-requisites

N/A

Breakdown of module hours

Learning and teaching hours	24 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	24 hrs
Placement / work based learning	0 hrs
Guided independent study	176 hrs
Module duration (total hours)	200 hrs

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Initial approval date	22 nd Aug 2022
With effect from date	Sept 2022

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Date and details of revision	
Version number	1

Module aims

- To develop a modern framework for the evaluation and selection of the best manufacturing processes utilised within the mechanical and manufacturing industry.
- To understand the key aspects of decision making that guide modern science and technology towards sustainable solutions.
- To develop a realistic scenario for sustainable technology implementation at a specific location or facility.

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

1	Critically evaluate and select appropriate design solution, materials, equipment, engineering technologies and manufacturing processes for various engineering problems.
2	Evaluate the environmental and societal impact of solutions to complex problems (to include the entire life-cycle of a product or process) and minimise adverse impacts.
3	Select and critically evaluate technical literature and other sources of information to solve complex problems.
4	Apply and critically evaluate an integrated or systems approach to the solution of complex problems.

In addition to the module learning outcomes, students will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: C8.

Assessment

Indicative Assessment Tasks:

Assessment 1: A time limited examination covering manufacturing design choices and factors affecting machining operations. Indicative exam time 2 hours.

Assessment 2: A coursework type investigation based on a realistic scenario for sustainable technology implementation at a specific location or facility in a business case style layout. Indicative word count 2000 words.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1, 2	Examination	50%
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 is taught through a combination of lectures and workshops. An active and inclusive approach is used to engage learners in the topics and will involve individual, group work and flipped learning experiences aligned to the university's Active Learning Framework (ALF). The approach offers students a flexible and adaptive learning experience that can accommodate a range of options that includes both on campus learning and remote learning where appropriate.

The Moodle VLE and other on-line materials and resources will be available to support learning. ALF offers a balance between the classroom elements and digitally enabled activity incorporating flexible and accessible resources and flexible and accessible feedback to support learning.

Indicative Syllabus Outline

Manufacturing systems.

Components of manufacturing system. A classification scheme for manufacturing systems.

Analysis of single-station systems. Analysis of single model assembly lines. Line balancing algorithms. Mixed model assembly lines.

Automated production lines. Analysis of transferred lines. Automated assembly systems. Quantitative analysis of assembly system.

Cellular manufacturing, Part families, classification and coding. Production flow analysis. Group technology. Quantitative analysis in cellular manufacturing.

Flexible manufacturing systems. FMS planning and implementation issues. Quantitative analysis of FMS.

Quality in design and manufacturing. Statistical process control and six sigma. Automated inspection. Quantitative analysis of inspection. Inspection techniques.

Manufacturing support systems. Advanced manufacturing planning. Inventory control. Just-in-time and lean production.

Sustainable Engineering

Principles of sustainable engineering. Sustainability approaches in engineering. Classification of sustainable engineering principles versus environmental, social, and economic criteria.

Technology development and lifecycle assessment. Technology readiness level (TRL). Metrics for technology evaluation. Sustainability index.

Indicative Bibliography:

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

Essential Reads

M. P. Groover, *Automation, Production systems, and Computer-Integrated Manufacturing*, 5th ed. Addison Wesley, 2020.

Other indicative reading

R. Dodds and R. Venables, *Engineering for sustainable development: guiding principles*. The Royal Academy of Engineering, 2005.

S. Kalpakjian, S. R. Schmid, *Manufacturing Engineering and Technology*, 8th ed. Pearson, 2019.

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

Creative
Ethical

Key Attitudes

Curiosity
Resilience
Confidence

Practical Skillsets

Digital Fluency
Organisation
Critical Thinking
Communication