Module specification

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Refer to the module guidance notes for completion of each section of the specification.

Module code	ENG6AJ
Module title	Manufacturing and Production Systems
Level	6
Credit value	20
Faculty	FAST
Module Leader	Ollivier Durieux
HECoS Code	100209
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng (Hons) Mechatronics Engineering	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	60 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	**0** hrs
Placement / work based learning	0 hrs
Guided independent study	140 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	24/09/2020
With effect from date	24/09/2020
Date and details of revision	
Version number	1

Module aims

1. To develop a modern framework for the evaluation and selection of the best manufacturing processes utilised within the mechanical and manufacturing industry in terms of both the management and the technical aspect of the operations.

2. To understand the main aspects (and rationale) for decision making in an industrial production environment.

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

1	Critically evaluate and select appropriate design solutions, materials and manufacturing processes for various engineering problems.
2	Systematically understand the factors that affect machining operations, the various control strategies and principles used to mitigate the sources of errors in machining processes.
3	Critically analyse how manufacturing operations are managed and integrated with other aspects of the business and how operations are managed across supply networks.
4	Formulate a thorough understanding of the complexity/need of management in order to achieve the right quality of product that meet the customer requirements, delivered on time, while making the most efficient use of the resources available.

Assessment

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.

Indicative Assessment Tasks:

Assessment 1: A time limited examination covering manufacturing design choices and factors affecting machining operations

Assessment 2: A case study type investigation based on an improvement of a manufacturing technique used in industries including costing, supply chain implication analysis in a business case style layout.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1, 2	Examination	50%
2	3, 4	Case Study	50%

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 delivered through detailed presentations combined with intermittent interactive sessions to enhance students' learning.

The learning experience will be further supported by tutorials and self-study work.

Case studies will be the backbone of the learning experience: Wherever possible real industrial problems will be used as an analysis subject.

Presentations and reports are designed to develop the involvement of the students in the module and develop their sense of inquisition.

Indicative Syllabus Outline

Engineering strategy: Principles and practice of industrial economics in the global economy. Key characteristics of modern manufacturing industries and change driving factors.

Manufacturing: Range of materials, technologies and processes involved in current best practice manufacturing. Selection and optimization methods in manufacturing processes (including forming and joining. Plastic deformation processes (lamination, bending). Material processing methods and mechanisms of materials degradation, product design improvement. Future trends in manufacturing and materials awareness.

Manufacturing systems engineering: Operational aspects of the main categories of machining processes knowledge, interaction between component/process tooling interaction understanding including factors affecting accuracy and precision of machining/grinding operations.

Control strategies of machining processes (errors shifting), machining cells integration, production machines management and planning. place/transition (PT) net (petri net) systems.

Process / production control: Operational aspects of the main categories of machining processes, manufacturing processes management, on time and resources management, inventory in manufacturing systems and forecasting techniques of stock.

Efficiency flow of work through a factory description, MRP techniques to scheduling description, implications of different co-ordination structures on job design. manufacturing operations integration with other aspects of the business. Supply networks/chain and IT systems support.

Manufacturing systems engineering: SMED (Single-Minute Exchange of Dies) and time reduction. Theory of constraints, and methods for line balancing for cycle time reduction.

Engineering operations management / lean manufacture: Operational systems analysis, Industrial processing and manufacturing systems management and maintenance. DFM

(Design For Manufacture) methods and evaluation. Product maturity level benchmarking. Optimisation of operations and resources. Risk, opportunities, cost, environmental issues, and fitness for purpose assessment.

Quality Assurance: Measurement and metrology (Measurement System Analysis) concepts and application, D&T for purpose (function and cost). Statistical process control techniques (SPC) VS quality level. TQM (Total Quality Management) within engineering context. Instrumentation techniques to measure product and process performance. Quality procedures using QA techniques, including Failure Mode and Effect Analyses (FMEA), Production Part Approval Process (PPAP), Advanced Product Quality Planning (APQP). National and international QA standards (ISO 9000/9001, ISO14000 and TS 16949). Lean Manufacturing tools and Six Sigma methodology.

Industry 4.0: Drivers and enablers of I4.0, the stages of the industrial revolutions, smart factories, IoT (Internet of Thing) and IIoT (Industrial Internet of Things). Data Science leading to data-driven decisions and automation. Collaborative robots in industrial contexts, smart automations, products and services. Getting ready for I4.0 and cybersecurity in engineering.

Industrial Engineering: Lean production techniques and design of production systems, time standards in manufacturing. Evaluation and prediction of the effect of learning on the cycle time of repetitive work.

Sustainable manufacturing: Drivers of, and barriers to, sustainable manufacturing. Sustainability and how businesses may respond to the sustainability challenge. Design for disposal or reuse (end-of-life), Toxic chemicals or other hazardous substances disposal considerations.

Plant Efficiency: Plant layout to facilitate efficient, effective and productive use of processes, people, space and facilities.

Indicative Bibliography:

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

Essential Reads

Kalpakhian, S. and Schmid, S. (2016), Manufacturing Processes for Engineering Materials. 6th ed. Harlow: Pearson Education.

Other indicative reading

Dickersbach, J.T. and Keller, G. (2010) Production Planning and Control with SAP ERP, 2nd Edn., SAP Press/Galileo Press.

Miltenburg, J. (2005) Manufacturing Strategy: How to Formulate and Implement a Winning Plan, 2nd Edn., Productivity Press.

Slack, N. and Brandon-Jones, A. (2019), Operations Management. 9th ed. Harlow: Pearson Education.

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. Click here to read more about the Glyndwr Graduate attributes

Core Attributes
Creative
Ethical

Practical Skillsets
Organisation
Communication