Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG5AR
Module Title	Mechanical and Manufacturing Systems and Business Management
Level	5
Credit value	20
Faculty	FACE
HECoS Code	100202
Cost Code	GAME
Pre-requisite module	None

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Mechatronics Engineering	Core

Breakdown of module hours

Learning and teaching hours	60 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	0 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**0** hrs
Placement hours	0 hrs
Guided independent study hours	140 hrs
Module duration (Total hours)	200 hrs

Module aims

To develop an understanding of and an overall appreciation of the knowledge of machine elements.

To develop an understanding and an overall appreciation of the knowledge and processes that lead to developing appropriate pneumatic and hydraulic systems.

To develop knowledge and skills on manufacturing system planning, design and management.

To develop and enhance the student's awareness of himself/herself as an engineer within the wider context in which an engineer must work, with specific emphasis on the development and operation of small, medium and large enterprises.

Module Learning Outcomes

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

1	Investigate the machine mechanism and machine mechanical dynamics, analysis and evaluate mechanical system performances.
2	Develop critical understanding of the design principles, methods and applications of machine systems, devices and components, including the design theory and calculation methods of basic components such as mechanical transmission, bearings, connectors, springs, etc.
3	Apply principles of Business finance and accounting to justify the value of engineering technology investments and apply benefits management, evaluate business practices within a company and the roles of engineers as team members contributing to the success and further development of that company; including activities such as planning and scheduling, evaluating outcomes, quality control and improvement in relation to engineering management.
4	Analysis, plan, design and implement the integrated manufacturing systems.
5	Analyse the stages of planning and implementing integrated manufacturing systems besides the basic principles of machine tool operation and fixture design for automated operations and be able to design simple fixtures and robot end effectors.

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: A 2-hour exam covering outcomes 1, and 2. It is an unseen time-constrained.

Assessment 2: A portfolio to cover outcomes 3, 4 and 5.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1, 2	Examination	2 hrs	20%	
2	3, 4, 5	Portfolio	3000 words	80%	

Derogations

None

Learning and Teaching Strategies

The module will be presented to students through lectures, tutorials, and industrial visits and investigations.

Welsh Elements

Programme is delivered in English and Chinese, however students can submit assessments in Welsh.

Indicative Syllabus Outline

Company development: Small, medium, large-scale enterprises; analysis of growth (case study). Case for rationalisation.

People in Organisations: Relationship between own job role and that of others at work; legal framework (Health and Safety, etc); authority/delegation; leadership and motivation; setting/ achieving realistic goals/targets; human resource management; operation of personnel activities.

Customer/Client Relationship: Identification of market; customer satisfaction; changes in customers, e.g. social, demographic and economic changes; new product development, patent protection; cost-effectiveness and pricing; communication skills.

Control/Management Activities: Planning, organising/control techniques; management of projects and continuous operations; obtaining finance; budgetary control, cost effectiveness; cost-benefit analysis, budget proposals.

Manufacturing systems engineering: Planning and implementing integrated manufacturing systems, principles of machine tool operation (including maintenance, repair and condition monitoring), principles of tool and fixture design for automated operations, robotics in automation, the different types of sensor used in automation, control strategies of machining processes (errors mitigation), machining cells integration, production machines management and planning.

Machine Elements: Principles, operation, and constructions of machine elements: bearings, cam, spur gears, helical gears, bevel gears, worm gears, clutches and brakes.

Mechanism Trains: Principles, operation, and constructions of parallel axis gear trains, determining tooth numbers, epicycle gear trains, Bevel-gear epicycle trains, all-wheel drive trains, applying solutions to a practical situation.

Hydraulics: Principle and operation of individual components within typical systems and examine various applications. Principle and operation of complete hydraulic systems and discuss the arrangement of the components to enable specific functions to be carried out. Analyse the operation of each component within the system. Advantages and disadvantages of hydraulic systems.

Pneumatics: Principle and operation of individual components within typical systems. Principle and operation of complete aeronautical/mechanical systems. Analysis of performance of individual components and system operation.

Indicative Bibliography

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

Essential Reads:

Groover, M.P. (2015), Automation, Production Systems and Computer-Integrated Manufacturing. Harlow: Pearson.

Other indicative reading:

Uicker J.J. et al. (2011) Theory of Machines and Mechanisms 4th Edn, OUP USA

Nicholas, J.M. & Steyn, H. (2011) Project Management for Engineering, Business, and Technology, 4th Edn., Butterworth-Heinemann.

Turner I C. (1995) Engineering Application of Pneumatics and Hydraulics, Butterworth Heinemann.

Hanieh A.A. (2012) Fluid Power Control: Hydraulics and Pneumatics, Cambridge International Science Publishing.

Alasdair Gilchrist (2016) Industry 4.0: The Industrial Internet of Things; Apressa

Administrative Information

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Initial approval date	24/09/2020
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Date and details of revision	22/07/2025 revalidated, LO's 1, 2 & 3 reworded not changed, assessment changed from report to exam, updated template, derogation removed
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