Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG5AX
Module Title	Industrial Automation and PLCs
Level	5
Credit value	20
Faculty	FACE
HECoS Code	100166
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

The module aims to develop essential knowledge relating to industrial process automation and industrial automation systems, and to facilitate the understanding of principles of programmable logic controller (PLC) and PLC controlled systems and how they interface with field devices to form industrial control systems. It familiarizes students with PLC and SCADA system software, communication methods, and programming techniques.

Module Learning Outcomes

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

1	Develop critical knowledge and skills of Logic programming methods and functionality of basic, intermediate and developing into the advanced instruction set.
2	Develop critical skills of establish PLC communications; edit existing, and develop new PLC programmes and design HMI and SCADA whilst considering system performance.
3	Develop critical understanding of the principles, characteristics, device selection principles, system facilitating methods, and evaluate devices and configurations to suit application specifications, development budget constraints, and quality control requirements.
4	Develop critical knowledge and skills on plan and manage process control system design; Integrate PLCs as part of a control system; effectively communicate the design.

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.

A portfolio (Practical work) - several exercises developing knowledge of industrial automation system design, PLC functionality and programming methods. All outcomes will be covered by this assessment.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1, 2, 3, 4	Portfolio			

Derogations

None

Learning and Teaching Strategies

Lectures - presentation of theory, facts and concepts, relating to instrumentation, in order to convey critical information. Interaction or active learning should be implemented to develop an understanding of principles and concepts and stimulate discussion.

Demonstrations – Laboratory experiments performed in order to demonstrate instrument characteristics.

Specialist knowledge and expertise from industrial partners can and will be disseminated to other students where relevant.

PLC and computer Labs – Use of software in order to enhance the teaching and learning in software development knowledge and skills

Welsh Elements

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

Indicative Syllabus Outline

Industrial automation: automation principles and industrial automation project; project scope, objectives, function specifications; initiating, planning, and executing industrial automation projects; industry standard; implementation, testing and evaluation of industrial automation systems.

Data acquisition and processing for automation. Signal conditioning.

PLCs for automation: industry standard PLC equipment; principles, structure and architecture; interfacing with field devices; configuration of PLC control systems; sensors and actuators; hardware and software; discrete devices, analogue devices.

Programming for industrial automation: fundamental programming concepts; program structure; principles of logic programming; algorithms and program design; functions, sub-routines; fundamental data structures; manipulation display and control of data and database; data capture and representation; advance PLC functionality; structured programming.

PLC-based process control system design: assignment of automation tasks; automation system configuration; communication protocols; HMI design; SCADA; ethical, economical, safety, security sustainability issues in automation.

Maintenance, repair and condition monitoring: the methods for the detection, measurement, assessment, and condition monitoring; safety, security economics, sustainability issues in condition monitoring system design, implementation and operation.

Indicative Bibliography

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

Essential Reads:

Rabiee, M (2017) Programmable Logic Controllers: Hardware and Programming, 4th edition, Goodheart-Wilcox Publisher.

Other indicative reading:

Dunn, W. (2018), Fundamentals of Industrial Instrumentation and Process Control, Second Edition, McGraw-Hill Education

Anderson, N (1997) Instrumentation for Process Measurement and Control, Third Editon, CRC Press

Bolton, W. (2015) Instrumentation and Control, Newnes

IET Study Resources: http://www.theiet.org/students/resources/index.cfm

Administrative Information

For office use only	
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