

Module specification

When printed this becomes an uncontrolled document. Please access the **Module Directory** for the most up to date version by clicking on the following link: [Module directory](#)

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

Module code	ENG5AX
Module title	Industrial Automation and PLCs
Level	5
Credit value	20
Faculty	FAST
Module Leader	Dr Zheng Chen
HECoS Code	100166
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

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

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:

By means of 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	Weighting (%)
1	1, 2, 3, 4	Portfolio	100%

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

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

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 Edition, CRC Press

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

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

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

Enterprising
Creative
Ethical

Key Attitudes

Curiosity
Confidence

Practical Skillsets

Digital Fluency
Communication