

Module specification

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Module Code	ENG5AC
Module Title	Industrial Automation and PLCs
Level	5
Credit value	20
Faculty	FAST
HECoS Code	100160
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng / MEng Electrical and Electronic Engineering	Core
BEng (Hons) Production Engineering	Core
BEng (Hons) Industrial Engineering Design (Electrical & Electronic)	Core
FdEng Industrial Engineering (Electrical and Automation) FdEng Industrial Engineering (Manufacturing and Production)	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	40 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	40 hrs
Placement / work based learning	0 hrs
Guided independent study	160 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	11/09/19

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With effect from date	11/09/19
Date and details of revision	Sept 22: module learning outcomes and content update in engineering revalidation
Version number	2

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.
- To familiarize 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 knowledge on industrial process automation and industrial automation systems and the ethical, economical, sustainability issues in automation
2	Develop knowledge and skills on plan and manage process automation system design; Integrate PLCs as part of a control system; effectively communicate the design.
3	Evaluate devices and configurations to suit application specifications, development budget constraints, safety and security, and quality control and quality improvement requirements
4	Establish PLC communications, edit existing and develop new PLC programmes, and design HMI and SCADA whilst considering system performance.

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.

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

Derogations from Academic Regulations are in place for this module for some programmes. Please see the programme specification for further details and to check applicability.

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.

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; programme 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.

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update. Please *ensure correct referencing format is being followed as per University Harvard Referencing Guidance*.

Essential Reads

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

Other indicative reading

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

N. Anderson, *Instrumentation for Process Measurement and Control*, Third Edition, CRC Press, 1997.

W. Bolton, *Instrumentation and Control*, Newnes, 2015.

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.

Guidance, from the following list, delete the attributes that are not covered by this module

Core Attributes

Engaged
Enterprising
Creative
Ethical

Key Attitudes

Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets

Digital Fluency
Organisation
Leadership and Team working
Critical Thinking
Emotional Intelligence
Communication