Module specification

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

Module code	ENG432
Module title	Programmable Logic Controllers
Level	4
Credit value	20
Faculty	FAST
Module Leader	Dr Z Cheng
HECoS Code	100166
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
HNC Electrical & Electronic Technology	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	**60** 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	August 2016
With effect from date	September 2021
Date and details of revision	6 July 2021, revalidated
Version number	Version 2

Module aims

To provide fundamental knowledge of control technology with multiple interfaces (I/Os) to connect and control multiple mechatronic devices such as sensors and actuators. To understand the concepts of PLCs and to investigate the internal architecture of PLCs.

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

1	Investigate the design and operational characteristics of PLCs
2	Investigate PLC information and communication techniques
3	Investigate and apply PLC programming techniques along with management of memory allocation and structure

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 is 100% in-course.

Assessment One: A coursework covering the design characteristics, devices comms' links architecture and operation (1600 words).

Assessment Two: Practical - develop and implement of PLC programming to fulfil requirements from industrial problem (2400 words).

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1	Coursework	40%
2	2, 3	Practical	60%

Derogations

None

Learning and Teaching Strategies

The module will be presented to students through a specified series of lectures assisted by notes via VLE platform. Lectures will deliver key concepts, ideas, theories and examples.

Initial structured lectures followed by practical exercises and the design of applications of PLCs.

Indicative Syllabus Outline

1. **Design & operational characteristics:** unitary, modular, rack-mounted. I/P & O/P devices, mechanical switches, non-mechanical digital sources, transducers, relays. Communication links, twisted pair, coaxial, fibre optic network. Internal architecture, CPU, ALU, storage devices, memory, opto-isolators, I/P and O/P units, flags shift

registers. Operational characteristics, scanning, performing logic operations, continuous updating mass I/O copying.

2. **Information & communications techniques:** Forms of signal, analogue (4-20mA), digital, discrete. Resolution & relationships, 8-bit, 10-bit, 12-bit. Number systems, decimal, binary, octal, hexadecimal, BCD. Protocols, RS232, IEE488, RS422, 20 mA. Networking methods and standards, master to slave, peer to peer, ISO, IEE, MAP Logic functions, AND, OR, EXCLUSIVE OR, NAND, NOR.
3. **Programming Techniques:** Methods of programming: ladder and logic diagrams, statement lists. Advanced functions, less than, greater than, binary to BCD, calculations. PID control. Testing & debugging, forcing inputs, forcing outputs, changing data, comparing files. Associated elements, contacts, coils, timers, counters, override facilities, flip-flops, shift registers, sequences.

Indicative Bibliography:

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

Essential Reads

W.Bolton. (2015) Programmable Logic Controllers. 6th ed. Newnes

Other indicative reading

Website: PLC Manual http://www.plcmanual.com

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
Engaged
Ethical

Key Attitudes
Curiosity
Resilience
Confidence

Practical Skillsets
Digital Fluency
Critical Thinking
Communication