Programmable Logic Controllers and Industrial Automation

Module Information

2022.01, Approved

Summary Information

Module Code	5504ICBTEL
Formal Module Title	Programmable Logic Controllers and Industrial Automation
Owning School	Engineering
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
International College of Business and Technology

Learning Methods

Learning Method Type	Hours
Lecture	45
Off Site	6
Practical	9

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit

APR-PAR	PAR	April	12 Weeks
JAN-PAR	PAR	January	12 Weeks
SEP-PAR	PAR	September	12 Weeks

Aims and Outcomes

Aims	This module focus on the design and operational characteristics and internal architecture of programmable logic control systems. It examines the signals used and the programming techniques that can be applied. The unit also provides learners with the opportunity to produce and demonstrate a program for a programmable logic controller device.Understanding of fluid power systems and their modern industrial application so that students can read and interpret pneumatic and hydraulic fluid power diagrams applications and enable them to design fluid power circuits and be able to interface pneumatic systems with PLC.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Explain the design and operational characteristics of a PLC system
MLO2	2	Apply ladder programme to solve engineering problems.
MLO3	3	Illustrate and interpret fluid power diagrams by understanding the construction, function and operation of pneumatic and hydraulic components.
MLO4	4	Demonstrate design pneumatic and hydraulic circuits and circuit interface with PLC automation design include flow control by using simulation and practical.

Module Content

Outline Syllabus	1. Understand the design and operational characteristics of a PLC system.Design characteristics: unitary; modular; rack-mounted.Input and output devices: mechanical switches; non-mechanical digital sources; transducers; relays.Internal architecture: central processor unit (CPU); arithmetic logic unit (ALU); storage devices; memory; opto-isolators; input and output units; flags; shift; registers.Operational characteristics: scanning; performing logic operations; continuous updating; mass input/output (I/O) copying.2. Be able to apply ladder programme to solve engineering problems.Logic functions: writing programmes using logic functions based on relay ladder logic (AND; OR; EXCLUSIVE OR; NAND; NOR).Write programs: use of ladder and logic diagrams; statement lists; Boolean algebra; function diagrams; graphical programming languages; production of a PLC.Advanced functions: less than; greater than; binary to BCD conversion; proportional feedback control.Producing and storing text: contact labels; rung labels; programming lists; cross-referencing.Test and debug programs: forcing inputs, forcing outputs; changing data; comparing files (tapes, EPROM, disc); displayed error analysis.Associated elements: contacts; coils; timers; counters; override facilities; flip-flops; shift registers; sequencers.3. Be able to read and interpret pneumatic and hydraulic fluid power diagrams.Pneumatic and hydraulic symbols: read and interpret e.g. energy conversion, valve, energy transmission, control and miscellaneous symbols; use of appropriate British and International.Standards e.g. ISO 1219-2 (2009), ISO 9461 (Hydraulics), ISO 5599 (Pneumatics).Pneumatic and hydraulic equipment: types, construction, function and operation e.g. air compressors, coolers, dryers, receivers, distribution equipment, fluid plumbing and fittings, drain traps, FRL air service units, valves, actuators, seals.Performance characteristics: air compressors e.g. volumetric efficiency, compression ratio, isothermal efficiency; hydraulic pumps e.g. operating efficiency, losses, flow rate, operating pressure, shaft speed, torque and power.4. Be able to design pneumatic and hydraulic circuits.Pneumatic circuits: e.g. directional control, piloted control, reciprocating control, logic, memory, multi-actuator circuits with sequential operation, cascading techniques, stepper circuits, pulsed signals, latching circuits, direction and speed control of rotary actuators and air motors.Hydraulic circuits: e.g. sequential operation of multi-actuator circuits, regenerative circuits, counterbalance circuits, ‘meter-in’ and ‘meter-out’ circuits, bleed-off circuits, direction and speed control of hydraulic motors.Electro-pneumatic and electro-hydraulic circuits: use of electronic logic devices and systems and their interface with fluid power circuits; solenoid valve arrangements.5. Pneumatic and Hydraulic circuit interface with PLC
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Exam	Examination	50	2	MLO1, MLO2, MLO3
Essay	Practical	50	0	MLO4

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Karl Jones	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings