Liverpool John Moores University

Title:	PROGRAMMABLE LOGIC CONTROLLERS AND INDUSTRIAL AUTOMATION
Status:	Definitive
Code:	**5504ICBTEL** (127020)
Version Start Date:	01-08-2021
Owning School/Faculty:	Engineering
Teaching School/Faculty:	ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level:	FHEQ5	**Credit Value:**	15	**Total Delivered Hours:**	62
Total Learning Hours:	150	**Private Study:**	88		

Delivery Options
Course typically offered: Semester 1 and Summer

Component	Contact Hours
Lecture	45
Off Site	6
Practical	9

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	50	2
Practice	AS2	Practical (2500 words)	50	

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.

Learning Outcomes

After completing the module the student should be able to:

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

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Examination	1	2	3
Practical	4		

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 eg energy conversion, valve, energy transmission, control and miscellaneous symbols; use of appropriate British and International.
Standards eg ISO 1219-2 (2009), ISO 9461 (Hydraulics), ISO 5599 (Pneumatics).
Pneumatic and hydraulic equipment: types, construction, function and operation eg air compressors, coolers, dryers, receivers, distribution equipment, fluid plumbing and fittings, drain traps, FRL air service units, valves, actuators, seals.
Performance characteristics: air compressors eg volumetric efficiency, compression ratio, isothermal efficiency; hydraulic pumps eg operating efficiency, losses, flow rate, operating pressure, shaft speed, torque and power.

4. Be able to design pneumatic and hydraulic circuits.
Pneumatic circuits: eg 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: eg 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

Learning Activities

Fluid power applications and PLC architecture and applications acquired through lectures, and computer laboratory classes.
Basic electromechanical pneumatic and hydraulic system interface with PLC will be tested using laboratory.

Notes

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