

Title:	PLC Application APPROVED
Long Title:	PLC Application
Module Code:	ELEC7012
Credits:	5
NFQ Level:	Intermediate
Field of Study:	Electrical Engineering
Valid From:	Semester 1 - 2014/15 (September 2014)
Module Delivered in	3 programme(s)
Module Coordinator:	JOSEPH CONNELL
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Module Description:	This module familiarises the student with the concepts of programmable control in automation. On completing the module, the student will have developed a clearer understanding of the application of PLC's and will also be aware of safety requirements and the peripherals associated with PLC's in automated plants.
Learning Outcomes	
<i>On successful completion of this module the learner will be able to:</i>	
LO1	Describe and specify types of input transducers/sensors and other switching devices associated with PLC inputs for industrial processes.
LO2	Describe the input output interface circuits and their role in the PLC's reliability.
LO3	Use a number of PLC programming languages to develop control solutions.
LO4	Test, debug, and rectify programs using software tools.
Pre-requisite learning	
Module Recommendations	
<i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>	
No recommendations listed	
Incompatible Modules	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.</i>	
No incompatible modules listed	
Co-requisite Modules	
No Co-requisite modules listed	
Requirements	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.</i>	
No requirements listed	
Co-requisites	
No Co Requisites listed	

Module Content & Assessment

Indicative Content

Safety in automation systems

Implementation of emergency stop and guard circuits, physical limit of movement by means of limit switches, reporting of hard-wired circuit stopping.

PLC hardware fundamentals

Block diagram of PLC architecture, power supply, I/O interface circuits, sink and source input circuits, address areas, address identifiers, types of output switching.

Input Devices

Manually operated switching devices, automatically operated switches, capacitive and inductive proximity sensor operating principles and output switching polarity, photoelectric sensor types and sensing characteristics and output switching polarity.

Output Devices

Contactors, electromagnetically operated solenoids and valves, sounders, standard operating voltages

PLC Programming Languages

Introduction to commonly used PLC programming languages such as, Instruction list (IL), a low-level instruction list language based on mnemonics, Ladder diagram (LD), a graphical programming language evolved from electrical diagrams. Function block diagram (FBD), a graphical programming language based on function blocks.

PLC Instruction Set

PLC Instruction Set Instructions set presentation with ladder. Instruction format, e.g. operation, operand, etc. Introductory examples using instructions.

Combinational Logic

Use of Boolean instructions such as; AND, OR, inverse AND, inverse OR, NOT, etc, to assemble basic combinational logic functions.

Special Functions

Basic exercises involving timers, counters, comparators, shift registers, edge detection, etc.

Analog Handling

Types of physical quantities, standard signal levels, input resolution, using raw analog-digital data, scaling analog values, displaying physical quantities, etc.

PLC Programming Software

Introduction to one or more PLC software packages. Making new program files, saving files, opening existing files, managing files, etc. Use of programming software to develop control solutions from first principles or descriptive specification. Use of programming software to monitor and debug control program.

Projects

Projects Developing I/O assignments and symbolic listing. Control program solutions for written specifications Testing program solutions with software. Printer setup and printout of control program documentation.

Assessment Breakdown

	%
Course Work	100.00%

Course Work

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Other	In class examination	1,2,3	50.0	Sem End
Written Report	Assessment of practical competency through laboratory based assignments.	3,4	50.0	Every Week

No End of Module Formal Examination

Reassessment Requirement

Coursework Only

This module is reassessed solely on the basis of re-submitted coursework. There is no repeat written examination.

The institute reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time

<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Independent & Directed Learning (Non-contact)	Student review and study.	4.0	Every Week	4.00
Lab	Theory and associated practical application in a laboratory environment.	3.0	Every Week	3.00
Total Hours				7.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				3.00

Workload: Part Time

<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lab	Theory and associated practical application in a laboratory environment.	3.0	Every Week	3.00
Independent & Directed Learning (Non-contact)	Student review and study.	4.0	Every Week	4.00
Total Hours				7.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				3.00

Module Resources
<i>Recommended Book Resources</i>
<ul style="list-style-type: none"> • E.A. Parr 2003, <i>Programmable Controllers-An Engineer's Guide</i>, Third Ed., 9, Newnes Oxford OX2-8DP, England [ISBN: ISBN:0-7506-5757-X] • Richard Cox 2001, <i>Technician's Guide To Programmable Controllers</i>, Fifth Ed., 20, Thomson Delmar Learning Albany, NY 12212-5015 [ISBN: ISBN:0-7668-1427-0] • Uwe Graune, Mike Thielert, Ludwig Wenzl,, <i>LOGO!: Practical Training</i> [ISBN: 978-3-89578-338-8] • Hans Berger,, <i>Automating in STEP 7 Basic with SIMATIC S7-1200</i> [ISBN: 978-3-89578-356-2]
<i>This module does not have any article/paper resources</i>
<i>Other Resources</i>
<ul style="list-style-type: none"> • Website: http://www.plcdev.com/ • Website: http://www.automation.siemens.com/ • Website: http://ab.rockwellautomation.com/

Module Delivered in			
Programme Code	Programme	Semester	Delivery
CR_EEPSY_8	<u>Bachelor of Engineering (Honours) in Electrical Engineering</u>	5	Mandatory
CR_EELEC_7	<u>Bachelor of Engineering in Electrical Engineering</u>	5	Mandatory
CR_EMTEF_6	<u>Certificate in Maintenance Technology Fundamentals</u>	2	Mandatory