

Module Title:	Advanced PLCs
Language of Instruction:	English
Credits:	5
NFQ Level:	7
Module Delivered In	4 programme(s)
Teaching & Learning Strategies:	This module will be delivered through a mix of lectures, laboratory assignments and projects including a professional write up. It will employ a mixture of active/task-based learning, reflective learning and problem-based learning.
Module Aim:	The aim of this module is to develop an in-depth understanding and insight to control, analysis, and visualisation of advanced programming methods for dynamic systems using Programmable Logic Controllers (PLCs), Human Machine Interfaces (HMI/SCADA), safely and ethically as used in automated processes across a range of industrial applications.

Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Plan, develop and, debug control (PLC) and visual (HMI/SCADA) models using a combination of IEC PLC languages and embedded scripting.
LO2	Employ good and safe practice in control system design and development.
LO3	Set up industrial networks, communication protocols and security.
LO4	Specify and develop a PLC/HMI solution for a given application.

Pre-requisite learning	
Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</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.</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.</i>	
No requirements listed	

Module Content & Assessment

Indicative Content

PLC programming languages

Use of different program languages such as Ladder (LAD), Function Block Diagrams (FBD) and Structured Control Logic (SCL).

Advanced PLC Programming

Function Blocks, Data Blocks, comparator operations, safety circuit classification and integration into projects, fail safe operation and safe shutdown of equipment. Analogue input and output modules, Digital to Analogue conversion, Analogue to Digital Conversion, resolution, step outputs, sampling frequency, and associated calculations.

HMI Programming

Design and program a HMI to include multiple screens, buttons, pictures, animations, access levels, alarms and trends.

Interfacing, industrial networking and communication protocols

Introduction to the integration of network protocols into PLC programs.

Automation Project Design

Develop and implement automation project individually/collaboratively (depending on complexity).

Assessment Breakdown	%
Project	30.00%
Practical	20.00%
End of Module Formal Examination	50.00%

No Continuous Assessment

Project				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	A group/solo (depending on complexity) project based on real-world scenarios.	1,2,3,4	30.00	n/a

Practical				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	A set of practical exercises to complement the theory elements of the module.	1,2,3,4	20.00	n/a

End of Module Formal Examination				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	Various assessment(s) to reinforce learnings given throughout the semester.	1,2,3	50.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	12 Weeks per Stage	3.00
Laboratory	12 Weeks per Stage	2.00
Independent Learning Time	15 Weeks per Stage	4.33
Total Hours		125.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EFARG_B	Bachelor of Engineering (Honours) in Agricultural Systems Engineering	6	Elective
CW_EMMEC_B	Bachelor of Engineering (Honours) in Mechanical Engineering	6	Elective
CW_EFARG_D	Bachelor of Engineering in Agricultural Systems Engineering	6	Mandatory
CW_EEMEC_D	Bachelor of Engineering in Mechanical Engineering	6	Elective