SYST C2F04: Automation and PLC's for Agricultural Systems

Module Title:	Automation and PLC's for Agricultural Systems
Language of Instruction:	English

Credits:	10

NFQ Level:	6

Module Delivered In	2 programme(s)

Teaching & Learning Strategies:	Lectures, laboratories, demonstrations, research, project work and some study will be used to ensure the student has a wide range of experiences.

Module Aim:	The aim of this module is to provide students with an in depth understanding of electrical, electro-pneumatic and electro-hydraulic circuits, components and systems and introduction to PLC programming and control.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Build and test control circuits using training panels and electrical drawings.
LO2	Describe the operation of AC Motors understanding their specific starting characteristics, efficiencies, speed control and testing. Conduct 3 phase motor test, with appropriate equipment, and assess results.
LO3	Program and run a motor using a Variable Speed Drive (VSD) in the Lab.
LO4	Design of a compressed air system for a pneumatic air flow seed drill.
LO5	Describe Safe System of Work Plan (S.S.W.P.) for Lock-out Tag-Out in industrial applications with particular emphasis on the agricultural industry and sector.
LO6	Construct basic PLC programs, understand Inputs, Outputs, CPU and control strategies, employing timers/counters in typical industrial programming scenarios (filling systems, production lines) recognising sinking and sourcing output control cards and their application within the agricultural sector.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
CAD 1 or equivalent

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Module Content & Assessment

Indicative Content
Electrical and Electro-pneumatic / Electro-hydraulic control circuits •Indirect control of basic electro-pneumatic circuits•Correct use of contactors/relay timers and proximity switches•Terminal labelling, standard notation•Design and representation of electrical control circuits for the control of basic electro pneumatic / hydraulicsystems• Recognising base positioning and start up conditions, emergency stop implications•Application of solenoid valves and proportional control valves, trouble shooting on circuits and logical steps in analysing problems on electro pneumatic / hydraulic circuits.
Safety and Isolation Procedures •Plant Isolation and safety protocols Lock-Out Tag-Out Risk assessment in maintenance and importance of procedures in isolation
Design of a compressed air system for a pneumatic air flow seed drill •Calculate Air requirements of the system. •Design air ring / circuit and considerations for maintenance, expansion and operation. •Identify / Calculate possible pressure drops around the circuit. •Drawings of circuit and typical details. •Safety - risk assessment and commissioning of compressed air system and equipment.
AC Motors •Installation of Direct-on-Line circuits, Direct on line with remote start/stops. •Emergency stops. •Sequential control circuits, Hand-off-Auto control circuits. •Insulation & continuity testing of motors. •Programming and running motor from VSD.
Basic PLC Programming •Input and Output control cards, connection strategies, sinking & sourcing cards, programming methods (statement list, Ladder logic, SFC) programming offline and compiling to Run, error checks and basic control of simulated plant.
Hydraulics •Pump selection and calculation of pressure and flow•Construction and analysis of hydraulic circuits for particular applications•Filtration and design of Offline filtration loops, with filter sizing and efficiency•Design of hydraulic power packs, including tank, frame, pump position, valve sub plate mounting, heating and cooling circuits.
Safety and Isolation Procedures •Two handed control in Pneumatics Operational safety with Hydraulics and Pneumatics Isolation procedures for maintenance - Lock-Out Tag-Out
Basic Electrical Control •Indirect switching using contactors, standard interlocks, emergency stop circuits, electrical wiring diagrams, c/w labs in control circuits for electro-pneumatic machines

Assessment Breakdown	%
Continuous Assessment	30.00%
Project	30.00%
Practical	40.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Examination	Class Test	2	15.00	Week 4
Examination	Class Test	5,6	15.00	Week 12

Project

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Project	Design of compressed air system for a pneumatic air flow seed drill.	4	30.00	Week 8

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Laboratory projects relating to Electrical, Hydraulic and Pneumatic circuits	1,3,5,6	40.00	Every Week

No End of Module Formal Examination

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

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	12 Weeks per Stage	2.00
Laboratory	12 Weeks per Stage	2.00
Lab/Lecture	12 Weeks per Stage	2.00
Independent Learning	15 Weeks per Stage	11.07
	Total Hours	238.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EFARG_B	Bachelor of Engineering (Honours) in Agricultural Systems Engineering	4	Mandatory
CW_EFARG_D	Bachelor of Engineering in Agricultural Systems Engineering	4	Mandatory