

Module Title:	Mechatronics for Agriculture
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, pneumatic and hydraulic circuits, components and systems.
Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Identify and describe common electrical components and instruments – define quantities, symbols, units and notation - with emphasis on components utilised in agricultural systems.
LO2	Apply circuit theory to solve problems relating to series and parallel circuits.
LO3	Describe the principal operation of pneumatic and hydraulic systems and ancillary equipment with a particular emphasis on agricultural applications and systems.
LO4	Construct electrical, pneumatic and hydraulic circuits / wiring diagrams in according with ISO symbols and graphically represent basic electrical / pneumatic / hydraulic circuits with respect to their application in agricultural systems.
LO5	Recognise standard safety protocols in construction of electrical, pneumatic and hydraulic systems, namely failsafe design, pressure relief and isolation procedures with particular emphasis on machinery design with applications in the agricultural sector.
LO6	Complete laboratory experiments using electrical, pneumatic and hydraulic apparatus and test equipment. Report on the findings.
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>	
CAD 1 or equivalent	

Module Content & Assessment

Indicative Content

Electrical Science Theory and Application

•Electrical properties of materials with respect to atoms, charge, voltage, current and resistance. •Conductors, semiconductors, and insulators with examples of each. •Resistivity and related problems. •Resistors, Capacitors and Inductors. •Ohm's law. •Energy and power (Watts Law). •The kilowatt hour (kWh) and related problems. •Power rating of resistors. •Kirchhoff's circuit laws.

Circuit Analysis

•Series, parallel and series-parallel circuit analysis. •Total power calculations. •Wheatstone bridge. •Transient behaviour of capacitors and inductors (RC and LC time constant).

Electrical Protection

•Electrical components, Fuses, M.C.B.'s, R.C.D.'s Discrimination

Compressors

Types of compressors Dryers, drain traps, condensate formation•Receivers and pipework•Filtration, lubrication & pressure reducing valves

Pneumatics

Basic Symbols ISO RP68P Cylinder, calculations, types and cushioning•3/2 and 5/2 Valves and their operation•Construction of simple circuits A+ B+ A-B•Safety Dump Valves

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	40.00%
Project	20.00%
Practical	40.00%

Continuous Assessment				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Examination	Class Test	1,2	20.00	Week 5
Examination	Class Test	3,4,5	20.00	Week 12

Project				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	Design of electrical & pneumatic circuit drawings using appropriate ISO symbols and drafting technique for two different systems.	4	10.00	Week 8
Project	Design of electrical & hydraulic circuit drawings using appropriate ISO symbols and drafting technique for two different systems.	4	10.00	Week 10

Practical				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Laboratory projects relating to Electrical, Hydraulic and Pneumatic circuits	4,5,6	40.00	Every Week

No End of Module Formal Examination

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

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	12 Weeks per Stage	2.00
Laboratory	12 Weeks per Stage	3.00
Lab/Lecture	12 Weeks per Stage	2.00
Independent Learning	15 Weeks per Stage	11.07
Total Hours		250.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EFARG_B	Bachelor of Engineering (Honours) in Agricultural Systems Engineering	1	Mandatory
CW_EFARG_D	Bachelor of Engineering in Agricultural Systems Engineering	1	Mandatory