



Title:	Electro-Pneu. & M/C maint. APPROVED
Long Title:	Electro-pneumatic Mechatronics
Module Code:	MECH6032
Duration:	1 Semester
Credits:	5
NFQ Level:	Fundamental
Field of Study:	Mechanical Engineering
Valid From:	Semester 1 - 2016/17 (September 2016)
Module Delivered in	7 programme(s)
Next Review Date:	September 2021
Module Coordinator:	GER KELLY
Module Author:	SEAN WILLIAMS
Module Description:	Part of this module progresses naturally from Mechatronics 1 (Pneumatics) Here new Control System technologies including Electro-Pneumatics, and Hydraulics are described. Circuit design and construction based upon these technologies will be completed. Also Maintenance procedures pertaining to Mechanical elements commonly found in Machines will be taught and reinforced by the student through the completion of a series of practical exercises.
Learning Outcomes	
<i>On successful completion of this module the learner will be able to:</i>	
LO1	Explain the working principles behind Electro-Pneumatics and Hydraulics.
LO2	Apply appropriate design methodologies to build electro-pneumatic circuits.
LO3	Describe mechanical maintenance procedures commonly used in machine transmission elements.
LO4	Complete practical exercises based upon key aspects of Machine Maintenance.
LO5	Work successfully in a team environment to complete coursework in building electro-pneumatic circuits and mechanical assemblies
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>	
1053	Mechatronics 1
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

Boolean Logic

Logic symbols, rules of boolean algebra, truth tables, karnaugh maps, boolean expression, problem solving.

Electropneumatics

Characteristics of electro-pneumatic components: Switches, symbols, mechanical contacting, proximity. Solenoids: introduction, operating principles, construction. Relays: introduction, working description, Sensors: magnetic, capacitive, inductive. Optical sensors: basic, opposed mode, retro reflective, diffuse, infrared. Electro - pneumatic circuit design for one and two relay circuits.

Hydraulics

Components of a hydraulic system. Pump types (fixed and variable displacement) ,Pump location, Pump selection, Circuit design, Fluid types, characteristics and properties. Preventative maintenance.

Power Transmission elements

Introduction, working principles, characteristics and maintenance procedures for: gears, belts, chains, couplings and clutches.

Lubrication

Principles and theory of lubrication, lubrication selection, methods of application, Properties of oil, grease and solid lubricants.

Seals

O-rings, gaskets, lip seals felt seals, packing and mechanical. principles of operation, materials and failure patterns.

Shaft Alignment

Reverse indicator and laser methods: principles of operation.

Condition Monitoring

Vibration analysis, debris monitoring, particle counting, thermography.

Assessment Breakdown

	%
Course Work	100.00%

Course Work

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Circuit design and build	1,2,5	10.0	Week 5
Practical/Skills Evaluation	Circuit design and build	1,2,5	10.0	Week 9
Practical/Skills Evaluation	Maintenance exercise completion	3,4,5	24.0	Every Week
Other	Formal assessment based upon Control Systems	1,2	30.0	Week 11
Other	Formal Assessment based upon Machine Maintenance	3	26.0	Week 12

No End of Module Formal Examination

Reassessment Requirement

Repeat the module

The assessment of this module is inextricably linked to the delivery. The student must reattend the module in its entirety in order to be reassessed.

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>
Lecture	Control Systems	1.0	Every Week	1.00
Lecture	Machine Maintenance	1.0	Every Week	1.00
Lab	Control Systems	1.0	Every Week	1.00
Lab	Machine Maintenance	1.0	Every Week	1.00
Independent & Directed Learning (Non-contact)	Student study	3.0	Every Week	3.00
Total Hours				7.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

Workload: Part Time				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Control Systems	1.0	Every Week	1.00
Lecture	Machine Maintenance lecture	1.0	Every Week	1.00
Lab	Electro- Pneumatics lab.	1.0	Every Week	1.00
Lab	Machine Maintenance lab.	1.0	Every Week	1.00
Independent & Directed Learning (Non-contact)	Student Study	3.0	Every Week	3.00
Total Hours				7.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

Module Resources

Recommended Book Resources

- Turner, Ian C. 2011, *Engineering applications of pneumatics and hydraulics*, 2nd Ed., 8 - 15, Adington, Oxen Routledge [ISBN: 9780415502887]
- Michael J. Pinches and Brian J. Callear 1996, *Power Pneumatics*, 1st Ed., 6 - 9, Prentice Hall Europe United Kingdom [ISBN: 0 13 489790 0]
- Dick Jeffrey 1991, *Principles of Machine Operation and Maintenance*, 4th Ed., 5-10, Butterworth-Heinemann United Kingdom [ISBN: 0 7506 0293 7]

Supplementary Book Resources

- Bolton, W 1997, *Pneumatic and Hydraulic systems*, 1-8, Butterworth Heinemann Oxford, Boston [ISBN: 0759638362]
- Michael J. Pinches & John G. Ashby 1988, *Power Hydraulics*, 1st Ed., 1 - 6, Prentice Hall United Kingdom [ISBN: 0 13 687443 6]

This module does not have any article/paper resources

Other Resources

- Websites.: *Students can access a world of information by entering appropriate search words in search engine sites.*
- E Book: Parr, E.A. 2011, *Hydraulics and pneumatics: a technicians and engineers guide* , Butterworth-Heinemann, Amsterdam: Boston.

Module Delivered in

Programme Code	Programme	Semester	Delivery
CR_EBIME_7	<u>Bachelor of Engineering in Biomedical Engineering</u>	3	Mandatory
CR_EMANF_7	<u>Bachelor of Engineering in Manufacturing Engineering</u>	4	Mandatory
CR_EMECH_7	<u>Bachelor of Engineering in Mechanical Engineering</u>	3	Mandatory
CR_EMTEF_6	<u>Certificate in Maintenance Technology Fundamentals</u>	2	Mandatory
CR_EBIME_6	<u>Higher Certificate in Engineering in Biomedical Engineering</u>	4	Mandatory
CR_EMECH_6	<u>Higher Certificate in Engineering in Mechanical Engineering</u>	3	Mandatory
CR_EMECN_7	<u>Parttime - Bachelor of Engineering in Mechanical Engineering</u>	4	Group Elective 1