MODULE DESCRIPTOR

Module Title

Mechatronics and Machine Learning

Reference	EN3552	Version	2
Created	March 2024	SCQF Level	SCQF 9
Approved	June 2021	SCQF Points	15
Amended	April 2024	ECTS Points	7.5

Aims of Module

To provide the student with the ability to demonstrate and apply mechatronics and its automation systems.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

1	Evaluate various components such as electrical and mechanical sensors, actuators, and electrical motors for mechatronics and automation systems.
2	Apply the design and analysis of mechatronic systems and its implementation in the form of automation systems in either laboratory or software based settings.
3	Apply intelligent systems approach and the principle of computational intelligence to the solution of complex problem in computational intelligence based digital systems with awareness of the wider context of engineering.

Indicative Module Content

Introduction to mechatronics: examples of mechatronic systems, automation concepts, design approaches. Mechanical components of motion, hydraulic, pneumatic, and mechanical actuation systems. Modelling of mechatronic systems. Sensors & Actuators: theory and operation, types of sensors and transducers, sensor/actuator selection, technologies and applications. Motors: Special motors; Stepper motors, types, principles, characteristics, and control; Switched reluctance motors, principles and applications; Brushless dc motors; Universal motor; Synchronous reluctance motor; Servomotors and drives; Motor selection. PLCs: Configuration and programming. Computational Intelligence based digital systems: Artificial Intelligent, Machine Learning, Artificial Neural Networks.

Module Delivery

Full-time students: This module is delivered by a combination of lectures and tutorials. It will be supported by practical examples and activities including computer based laboratory exercises. Part-time students: This module is delivered by a combination of lectures and tutorials online. It will be supported by online drop-in evening sessions.

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Indicative Student Workload	Full Time	Part Time
Contact Hours	40	40
Non-Contact Hours	110	110
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	150
Actual Placement hours for professional, statutory or regulatory body		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Coursework	Weighting:	100%	Outcomes Assessed:	1, 2, 3
Description:	Lab-based coursework exercises and a final report.				

MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

Component 1 comprises 100% of module grade. To pass the module, a D grade is required.

Module Grade	Minimum Requirements to achieve Module Grade:
A	A
B	B
C	C
D	D
E	E
F	F
NS	Non-submission of work by published deadline or non-attendance for examination

Module Requirements

Prerequisites for Module	EN2510 or equivalent (Electronic and Electrical Engineering students). EN1562 or equivalent (Mechanical and Electrical Engineering students).
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

1. Isermann, Rolf. Mechatronic Systems. London: Springer London, Limited, 2007. Web.
2. Regtien, Paul P. L, and Dertien, Edwin. Sensors for Mechatronics. 1st ed. San Diego: Elsevier, 2018. Elsevier Insights.
3. Crowder, Richard M. Electric Drives and Electromechanical Systems : Applications and Control / [internet Resource]. Second ed. Kidlington, Oxford; Cambridge, MA: Butterworth-Heinemann, 2020.
4. Hughes, Austin, and Drury, Bill. Electric motors and drives: fundamentals, types, and applications. 5th ed. Kidlington: Newnes, an imprint of Elsevier, 2019.
5. Bolton, W. Programmable Logic Controllers. 6th ed. Cambridge: Elsevier Science & Technology, 2015.
6. Awrejcewicz, J, et. al. Mechatronics: Ideas, Challenges, Solutions and Applications. Springer, 2015.
7. DORF, R.C. and BISHOP, R.C., 2017. Modern Control Systems. 13th ed. London: Pearson Education.
8. DU, K.L. and SWAMY, M.N.S., 2006. Neural Networks in a Softcomputing Framework. London: Springer.