Module Code:	ENG770

Module Title:	Mechatronics System Design

Level:	7	Credit Value:	20

Cost Centre(s):	GSEE	JACS3 code:	H640

School:	Applied Science, Computing & Engineering	Module Leader:	Andrew Sharp

Scheduled learning and teaching hours	40 hrs
Guided independent study	160 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
MSc Engineering (Mechatronics)	✓	☐

Pre-requisites
N/A

Module Aims
This module aims to develop the students understanding and concepts of mechanical/electrical control, by enhancing their knowledge of applications in mechatronic and industrial engineering so that they will be able to design a mechatronic system to meet an industrial specification.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Apply advance knowledge from theoretical work and investigative work to solve mechatronic problems;	KS1	KS3
		KS4	KS6
		KS10	
2	Demonstrate an in depth understanding of mechatronic engineering and concepts;	KS1	KS4
		KS6	KS10
3	Evaluate components and instruments, from manufacturers' data and principles of operation, in order to determine the most appropriate technology for a given application;	KS1	KS3
		KS4	KS6
		KS10	
4	Plan, design and test a mechatronic system.	KS1	KS4
		KS6	KS10
5	Develop suitable Matlab models to implement a process.	KS1	KS4
		KS6	KS10

Transferable skills and other attributes
1. Communication 2. ICT Technologies 3. Time management and organisation 4. Interpersonal skills 5. Problem solving 6. Information handling including numeracy

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Assessment:

Indicative Assessment Tasks:

Assessment One: The learning outcomes will be assessed by a case study design exercise which requires the student to interpret, specify, design, implement and evaluate a mechatronics system. This will be individually monitored and assessed.

Assessment Two: Learning outcomes will be assessed by an unseen 2 hour examination.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	4, 5	Case Study	50	N/A	2000
2	1,2, 3	Examination	50	2 hours	

Learning and Teaching Strategies:

The module will be delivered through practical investigation/demonstrations and Computer Simulations in support of formal lectures and tutorials. Also there will be extensive use of VLE (Moodle) for additional support and formative work outside of timetabled contact periods.

Syllabus outline:

Modelling and simulation of dynamic processes: Different types of mathematical models for an industrial dynamic process; Mechanical/Electrical analysis-based modelling; Empirical data-based modelling; Linear time invariant models; Model structure selection; Model parameter identification/estimation.

Analysis and simulation of a range of mechanical/electrical transducers and actuators for analogue/ digital interfaces such as; pressure/heat/chemical/electromechanical/optical.

Electronic interface design between the digital controller and the analogue/digital mechatronic processes to maximize the speed, efficiency and reliability of their operation.

Mechatronic systems design implementation using High level software industry standards, such as VEE /LabView and Matlab, and lower level control using Embedded micro controller functions. Use of PIC's, dedicated industrial microprocessors and PLC interfaces.

Indicative Bibliography:

Essential reading

Bolton W (2013) Mechatronics: Pearson Higher Ed

Other indicative reading

Devdas Shetty, Kolk Richard; (2012); Mechatronics System Design; CL Engineering

Alciatore D.; (2012); Introduction to Mechatronics and Measurement Systems; McGraw-Hill

Bagad V.S.; (2010) Mechatronics; Technical Publications Pune

Bishop R.H.; (2002) Mechatronics handbook : CRC Press