MODULE DESCRIPTOR

MODULE TITLE	**Mechatronics**				
MODULE CODE	**ER3200 (L6)**	**JACS CODE H730**	**CREDIT VALUE**	20	
DATE OF APPROVAL	Jan 2017			**VERSION NUMBER**	1
SCHOOL	Engineering		**PARTNER INSTITUTION**		

RELATIONSHIP WITH OTHER MODULES

Co-requisites		**Pre-requisites**		**Excluded Combinations**	

MODULE AIMS

This module introduces mechatronics system elements, different sensors, actuators, controllers, signal conditioning methods, and examples of software used in mechatronics systems development using different case studies.

MODULE CONTENT

Topics Typically Covered:

- Introduction to Mechatronics Systems
- Sensors and Transducers: Conventional Sensors – Robotic Sensors
- Controllers: Microprocessors, Microcontrollers, DAQ
- Examples of Software Used in Mechatronics Systems
- Different Types of Actuators
- Signal Conditioning: A/D's, Amplifiers, Filters, WB, PM, Protection
- Development of Mechatronics Systems; Mechatronics Project

INTENDED LEARNING OUTCOMES

On successful completion of this module a student will be able to:	
1.	Demonstrate knowledge the basic principles of Mechatronics and Measurement systems
2.	Apply the key aspects of mechatronics systems engineering
3.	Provide an overview of the sensors, amplifiers, conditioning circuits, and actuators
4.	Demonstrate knowledge the basic principles of controllers and the data acquisition systems

ASSESSMENT METHODS

The method of assessment for this module has been designed to test all the learning outcomes. Students must demonstrate successful achievement of these learning outcomes to pass the module.

Number of Assessments	**Form of Assessment**	**% weighting**	**Size of Assessment/Duration/ Word count** (indicative only)	**Category of assessment**	**Learning Outcomes being assessed**
1	Mini project with associated report	50%	1500 words + relevant material in appendices	Coursework	1, 2, 3, 4
1	Written exam	50%	2 hours	Examination	1, 2, 3, 4

MODULE PASS REQUIREMENTS

To pass this module you must achieve a mark of 40% or above, aggregated across all the assessments. Students registered for an IET-accredited award must also achieve a mark of 30% or above on each of the assessments.

APPENDIX

MODULE CODE: ER3200 MODULE TITLE: Mechatronics

LOCATION OF STUDY: *PRESTON CAMPUS*

MODULE TUTOR(S)	Dr. Ahmed Onsy

MODULE DELIVERY	Semester Long	Semester 1	**X**	Semester 2	**X**	Semester 3			
	Year long	Semester 1 & 2		**X**	Semester 2 & 3				
	Blended (pulse attendance)	Semester long (depending on entry point)/ (pulse attendance)							

MODULE LEARNING PLAN

LEARNING, TEACHING AND ASSESSMENT STRATEGY

The module is delivered on the Preston campus in Lectures and Lab sessions that include; learning about the theoretical part of the course, taking additional notes to those provided, and problem solving. Also, includes of practical software and hardware developments.

SCHEDULED LEARNING AND TEACHING ACTIVITY	**No of hours**
Lectures	
Tutorials and Practical	
TOTAL SCHEDULED LEARNING HOURS	48
GUIDED INDEPENDENT STUDY	
Class Preparation, reflection on feedback, directed learning, Mini project	
Preparation for assessment	
Examination Preparation	
TOTAL GUIDED INDEPENDENT STUDY HOURS	152
TOTAL STUDENT LEARNING HOURS ***These must add up to 200 hours per 20 credits***	200

BIBLIOGRAPHY AND LEARNING SUPPORT MATERIAL

The student will be provided with course notes and directed to relevant web sites and technical publications available through Blackboard
http://readinglists.central-lancashire.ac.uk/lists/D992FE59-6BE3-B988-3584-4E0A7EFF1B99.html

1.

MODULE DESCRIPTOR

MODULE TITLE	**Electromechanical Systems**				
MODULE CODE	**ER3201 (L6)**	**JACS CODE H360**	**CREDIT VALUE**	20	
DATE OF APPROVAL	Jan 2017			**VERSION NUMBER**	1
SCHOOL	Engineering		**PARTNER INSTITUTION**		

RELATIONSHIP WITH OTHER MODULES

Co-requisites		**Pre-requisites**		**Excluded Combinations**	

MODULE AIMS

This module introduces electromechanical systems' elements, including mechanical motion transmission systems, sensing and measurement of mechanical motion, electromechanical actuator selection and specification, sequential controller design, Digital I/O different types of drives (DC – AC) and industrial controllers. The module also demonstrated electromechanical systems in Mechatronics systems and intelligent machines.

MODULE CONTENT

Topics Typically Covered:

- Introduction to electromechanical systems' elements; mechanical motion transmission systems
- electromechanical actuator selection and specification
- DC motor: types, characteristics, speed control (analogue, PWM, rectifiers), direction control (H-bridge), braking control
- Stepper motors: Types and operation, speed and direction control
- AC motor: types, characteristics, theory of operation, control (Inverters, vector drive control).
- Introduction to industrial controllers, modules, programming
- Case studies of Electromechanical Systems

INTENDED LEARNING OUTCOMES

On successful completion of this module a student will be able to:	
1.	Evaluate the scope, context and significance of electromechanical systems and their applications
2.	Apply the key aspect of the operating principles of electromechanical actuators, motors, drives and motion control.
3.	Provide case studies of electromechanical systems using microprocessors/ microcontrollers in process control.

ASSESSMENT METHODS

The method of assessment for this module has been designed to test all the learning outcomes. Students must demonstrate successful achievement of these learning outcomes to pass the module.

Number of Assessments	**Form of Assessment**	**% weighting**	**Size of Assessment/Duration/ Word count** (indicative only)	**Category of assessment**	**Learning Outcomes being assessed**
1	Mini project with associated report	50%	1500 words + relevant material in Appendices	Coursework	1, 2, 3, 4
1	Written exam	50%	2 hours	Examination	1, 2, 3, 4

MODULE PASS REQUIREMENTS

To pass this module you must achieve a mark of 40% or above, aggregated across all the assessments. Students registered for an IET-accredited award must also achieve a mark of 30% or above on each of the assessments.

APPENDIX

MODULE CODE: ER3201 MODULE TITLE: Electromechanical Systems

LOCATION OF STUDY: *PRESTON CAMPUS*

MODULE TUTOR(S)	Dr. Ahmed Onsy

MODULE DELIVERY	Semester Long	Semester 1	**X**	Semester 2	**X**	Semester 3		
	Year long	Semester 1 & 2		**X**	Semester 2 & 3			
	Blended (pulse attendance)	Semester long (depending on entry point)/ (pulse attendance)						

MODULE LEARNING PLAN

LEARNING, TEACHING AND ASSESSMENT STRATEGY

The module is delivered on the Preston campus in Lectures and Lab sessions that includes; learning about the theoretical part of the course, taking additional notes to those provided, and problem solving. Also, includes of practical software and hardware developments.

SCHEDULED LEARNING AND TEACHING ACTIVITY	**No of hours**
Lectures	
Tutorials and Practical	
TOTAL SCHEDULED LEARNING HOURS	48
GUIDED INDEPENDENT STUDY	
Class Preparation, reflection on feedback, directed learning, Mini project	
Preparation for assessment	
Examination Preparation	
TOTAL GUIDED INDEPENDENT STUDY HOURS	152
TOTAL STUDENT LEARNING HOURS ***These must add up to 200 hours per 20 credits***	200

BIBLIOGRAPHY AND LEARNING SUPPORT MATERIAL

The student will be provided with course notes and directed to relevant web sites and technical publications available through Blackboard
http://readinglists.central-lancashire.ac.uk/lists/67EFC6E3-A171-7850-406A-C44EC603CA43.html

1.

MODULE DESCRIPTOR

MODULE TITLE	**Maintenance Management**				
MODULE CODE	**MP3704 (L6)**	**JACS**	H300	**CREDIT VALUE**	20
DATE OF APPROVAL	September 2016			**VERSION NUMBER**	3
SCHOOL	Engineering	**PARTNER INSTITUTION**			

RELATIONSHIP WITH OTHER MODULES

Co-requisites		**Pre-requisites**		**Excluded Combinations**	

MODULE AIMS

This module examines the main methods for developing a modern maintenance programme for industrial plants. It provides a comprehensive understanding of theory and practice of reliability centred maintenance and total productive maintenance to achieve high plant availability, optimise on product quality, and address safety and environmental issues. The module will also consider shutdown and turnaround within maintenance of complex systems.

MODULE CONTENT

Importance of maintenance: Objectives of maintenance – structure of the plant – reasons for and nature of maintenance – production – maintenance systems
Types of maintenance: maintenance systems – planned and unplanned maintenance – breakdown maintenance – corrective maintenance – opportunistic maintenance – routine maintenance Maintenance Policies, Strategies and options in Maintenance management. Maintenance forms/actions and their inter relationships, Brief descriptions of various Maintenance actions.
Preventive maintenance: predictive maintenance – condition based maintenance systems – design-out maintenance – selection of maintenance systems
Maintenance planning and scheduling: establishing a maintenance plan – items to be maintained
Safety precautions: characteristics of items to be maintained – classification of items – maintenance procedure – guidelines for matching procedures to items – universal maintenance procedure – establishing a new maintenance schedule
Maintenance organisation: resource characteristics – resources structure – maintenance control – administrative structure – training of maintenance personnel.
System operations and documentation: documenting maintenance operations – record keeping – data collection and analysis – failure statistics – planning and scheduling plant shutdowns
Depreciation & Machine Life: Replacement policies, spares and types of spares, spares planning, maintenance control, network techniques in maintenance activities, evaluation of maintenance performance.
TPM: The modern role of care and asset management through TPM. The TPM improvement plan. Planning and launching TPM. Maximising equipment effectiveness. Implementing autonomous maintenance. Equipment improvement and quality maintenance. The use of TPM /concepts (consisting of Pareto ABC analysis, Fishbone diagrams, OEE and 5S). Fault analysis. Industrial visits to see how TPM techniques are implemented. development and scope – basic systems of TPM – procedures and steps – productivity circles – TPM as a part of TQM – benefits of TPM
RCM: The changing world of maintenance. RCM; the seven basic questions. Step-by-step procedure in conducting RCM analysis. The Plant Register. Functions and Failures. Failure mode and effect analysis (FMEA). Failure consequences. Maintenance and decision making. Actuarial analysis and Failure data. Perspective loops. Default action. The RCM Decision diagram. The nature of Failure and Technical history. Implementing RCM.
The role and implementation of maintenance shutdown and turnaround in industrial plant.
Capacity utilisation, cost reduction approach to spares, reliability and quality of spares, spare parts procurement, inventory control of spare parts.

LEARNING OUTCOMES

On successful completion of this module a student will be able to:	
1.	Critically evaluate a system and produce a Total Productive Maintenance improvement plan

2.	Apply knowledge of Reliability Centered Maintenance analysis on equipment (Investigate how equipment operates and critically evaluate the equipment and come up with an improvement plan).
3.	Evaluate the importance of Total Productive Maintenance and Reliability Centered Maintenance strategies and how they are implemented in industrial plant.
4.	Demonstrate the ability to follow the key steps which must be taken to implement the recommendations arising from Reliability Centered Maintenance and Total Productive Maintenance strategies.
5.	Use appropriate software to analyse equipment and systems, and support decision making in implementing maintenance strategies.

ASSESSMENT METHODS

The method of assessment for this module has been designed to test all the learning outcomes. Students must demonstrate successful achievement of these learning outcomes to pass the module.

Number of Assessments	**Form of Assessment**	**% weighting**	**Size of Assessment/Duration/ Wordcount** (indicative only)	**Category of assessment**	**Learning Outcomes being assessed**
1	Coursework	40%	Report (1500 words)	Coursework	At least one of 1-4, 5
1	Examination	60%	2 hours	Examination	1, 2, 3, 4

MODULE PASS REQUIREMENTS

To pass this module you must achieve a mark of 40% or above, aggregated across all the assessments.

APPENDIX

MODULE CODE: MP3704 **MODULE TITLE:** Maintenance Management

LOCATION OF STUDY: *PRESTON CAMPUS*

MODULE TUTOR(S)	*Nathalie Renevier*

MODULE DELIVERY	Semester Long	Semester 1		Semester 2	**X**	Semester 3		
	Year long	Semester 1 & 2				Semester 2 & 3		
	Other (please indicate pattern of delivery)							

MODULE LEARNING PLAN

LEARNING, TEACHING AND ASSESSMENT STRATEGY

The teaching and learning strategy is designed to provide a range of delivery methods in a blended way to facilitate the development of skills in the module aims set out above. The course will be based on industrial international case studies.
About 50% of the module concentrates on the theories underpinning the subject, including cognition of cross disciplinary impact. 50% takes an active learning approach. Structured workshop sessions allow students to work in teams. The teaching and learning methods include: Lectures, Seminars, Workshops, Self-directed learning, Reading, E-Learning. Industrial field trips

SCHEDULED LEARNING AND TEACHING ACTIVITY	**No of hours**
Lectures (4 hour per week over 11 weeks)	
Field Trip (2 industrials visits 1/2day each)	
Lecture Revision and Assessment preparation	
TOTAL SCHEDULED LEARNING HOURS	60
GUIDED INDEPENDENT STUDY	
Class Preparation, reflection on feedback, directed learning	
Preparation for assessment	
Examination Preparation	
TOTAL GUIDED INDEPENDENT STUDY HOURS	140
TOTAL STUDENT LEARNING HOURS ***These must add up to 200 hours per 20 credits***	200

BIBLIOGRAPHY AND LEARNING SUPPORT MATERIAL

The student will be provided with course notes and directed to relevant web sites and technical publications available through Blackboard
Relevant topics from the following books:

Maintenance Engineering / Management General

(1) KAH Kobbacy and DNP Murthy, Complex system Maintenance Handbook, Springer 2008 edition (2008), ISBN-13: 978-1848000100
(2) A Wilson, Assets maintenance management A guide to developing strategies and improving performance, Industrial Press, Inc; 2Rev Ed edition(2008), ISBN-13: 978-0831133313
(3) L. Pintelon and F. Van Puyvelde, Maintenance Decision Making, Boek (2006), ISBN-13: 978-9033462511
(4) K. Venkataraman, Maintenance Engineering And Management, Prentice-Hall of India Pvt.Ltd (2007), ISBN-13: 978-8120331303
(5) M. Telang, A.D. Telang, Comprehensive Maintenance Management: Policies, Strategies and Options, PHI Learning (30 Jan 2010), ISBN-13: 978-8120339538
(6) K. Mobley, L.R. Higgins, D.J. Wikoff, Maintenance Engineering Handbook, McGraw -Hill Professional; 7 edition (2008), ISBN-13: 978-0071546461

Reliability Centred Maintenance

(7) R.T. Anderson, and L. Neri, Reliability-Centred Maintenance: Management and Engineering Methods, Kluwer Academic Publishers (1990), ISBN-13: 978-1851664702
(8) S Moubray, Reliability-Centred Maintenance, Butterworth and Heinemann 2nd revised edition (1998), ISBN-13: 978-0750633581
(9) A. M. Smith, G. R. Hincliffe, RCM: Gateway to World Class Maintenance, Butterworth Heinemann 2nd Revised edition (2003), ISBN-13: 978-0750674614

Total productive Maintenance

(10) P Willmott, TPM: A Route to World Class Performance, Butterworth Heinemann 2nd Revised edition (2000), ISBN-13: 978-0750644471
(11) T. Wireman, Total Productive Maintenance Second Edition (2004), ISBN-13: 978-0831102104
(12) S. Boris, Total Productive Maintenance: Proven Strategies and Techniques to Keep Equipment Running at Maximum Efficiency, McGraw-Hill Professional (2006) ISBN-13: 978-0071467339.
(13) J. Levitt, TPM Reloaded: Total Productive Maintenance, Industrial Press Inc.,U.S. (2010), ISBN-13: 978-0831134266

Lean Six sigma Maintenance

(13) M. Chambers, Abidian Continuous Improvement Lexicon: A working index of keywords associated with Lean, Six Sigma, Maintenance Excellence (2010), ISBN-13: 978-0984412006

CMMS

(14) T. Wireman, Successfully Utilizing CMMS/EAM Systems (Maintenance Strategy) Industrial Press, Inc; New edition (2008), ISBN-13: 978-0831133689

Others

(15) http://library.smrp.org/publications/ (Feb 2013)
(16) https://bsol.bsigroup.com/BsiBsol/BsolHomePage (Feb 2013)