Module Code:	ENG5AE

Module Title:	Instrumentation and Condition Monitoring

Level:	5	**Credit Value:**	20

Cost Centre(s):	GAME	JACS3 **code**: HECoS **code**:	H661 100166

Faculty	FAST	**Module Leader:**	Dr Z Chen

Scheduled learning and teaching hours	30 hrs
Guided independent study	170 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
BEng (Hons) Industrial Engineering Design (Electrical & Electronic)	✓	☐

Pre-requisites
None

Module Aims
The module aims to develop knowledge and skills on industrial process instrumentation and condition monitoring, and to develop knowledge of essential principles, components, devices, applications, and terminologies used in industrial practices and processes.

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 knowledge and understanding gained from theoretical work and investigative work to solving industrial engineering application problems.	KS3	KS4
		KS6	KS9
2	Evaluate instruments, from manufacturers' data and principles of operation, in order to determine the most appropriate technology for a given application.	KS3	KS5
		KS6	KS7
		KS10	
3	Demonstrate thorough understanding of condition monitoring principles and their applications in industries.	KS1	KS3
		KS6	
4	Select from a range of analysis methods and possible solutions to suit different practical analysis and design situations	KS1	KS2
		KS5	KS7

Transferable skills and other attributes

Information Technology skills
Evaluation and analysis skills
Communication skills
Decision making
Research skills

Derogations

A derogation from regulations has been approved for this module which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Assessment:

Indicative Assessment Tasks:

Assessment 1 - A Case Study should be made which examines several technologies for measuring the same measurement. Manufacturers' recommendations and their own case studies should be examined with findings summarised into advantages/disadvantages, this should be completed in conjunction with experimental work in order to prove/disprove manufacturers claims.

Assessment 2 – A portfolio representing individual tasks on the understanding of condition monitoring principles and the investigation of the industrial applications of condition monitoring.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration or Word count (or equivalent if appropriate)
1	1, 2	Case study	50%	2500 words
2	2, 3, 4	Portfolio	50%	2500 words

Learning and Teaching Strategies:

Lectures - presentation of theory, facts and concepts, relating to instrumentation, in order to convey critical information. Interaction or active learning should be implemented to develop an understanding of principles and concepts and stimulate discussion.

Demonstrations – Laboratory experiments performed in order to demonstrate instrument characteristics.

Specialist knowledge and expertise from industrial partners can and will be disseminated to other students where relevant.

Computer Labs – Use of software in order to aid development of understanding and to implement software simulations.

Syllabus outline:

Process and measurements: different industrial process; process variables; inter-relationship between process variables and their effects upon measuring systems and instrumentation; the range of types of sensors, actuators and motor hardware used in industrial process and their operation, construction and application.

Instrumentation of industrial process: design/selection, implementation and commissioning a system of measurement for a given process variable; organisational standards; data acquisition and analysis for condition monitoring and process control; appropriate software to analyse equipment and systems.

Maintenance, repair and condition monitoring: the methods for the detection, measurement, assessment, and condition monitoring; NDT, vibration, temperature, etc.; reliability centred maintenance (RCM) strategies; different analysis techniques to be able to critically analyse collected data from various monitoring equipment; safety, security economics, sustainability issues in condition monitoring system design, implementation and operation.

Bibliography:

Essential reading

Dunn, W. (2018), Fundamentals of Industrial Instrumentation and Process Control, Second Edition, McGraw-Hill Education

Other indicative reading

Morris, A.S. (2011) Measurement and Instrumentation Theory and Application, Academic Press

Bolton, W. (2015) Instrumentation and Control, Newnes

IET Study Resources: http://www.theiet.org/students/resources/index.cfm