PRIFYSGOL glyndŵr UNIVERSITY

MODULE SPECIFICATION FORM

Module Title:	**Transducers, Measurements and Process Control**	Level:	**5**	Cedit Value:	**10**

Module code: (if known)	**ENG50G**	Cost Centre:	**GAEE**	JACS2 code:	**H660**

Semester(s) in which to be offered:	**1**	With effect from:	**July 2015**

Office use only: To be completed by AQSU:	Date approved: **July 2015** Date revised: Version No: 1

Existing/New: **New**	Title of module being replaced (if any): N/A

Originating Academic area:	**Engineering and Applied Physics**	Module Leader:	**R Holme**

Module duration (total hours)	100	**Status:** core/option/elective (identify programme where appropriate):	**Free-standing 10-credit component comprising first half of ENG555 (Instrumentation and Control Systems Engineering).**
Scheduled learning and teaching hours	36		
Independent study hours	64		
Placement hours	0		

Percentage taught by Subjects other than originating Subject (please name other Subjects):	**0%**

Programme(s) in which to be offered: **Enginering European Programme** (Non Award Bearing)	Pre-requisites per programme (between levels):	**None**

Module Aims:

To develop methods of obtaining measurements of system variables in an industrial environment and to compare the operation of differing transducers by analysing response time, accuracy, stability and cost. To understand the transduction process, analyse various transducer types, hence to select and apply these to process control.

Expected Learning Outcomes

Knowledge and Understanding:

At the completion of this module, the student should be able to:

1. Analyse the measurements of an industrial process in terms of the physical quantities which constitute the measured variables; Define the principles of operation of common transducers and match these to the requirements of the measured variables;
2. Compare the parameters of a range of transducers for a given task (eg the measurement of flow) and hence select an appropriate device;
3. Define and apply the criteria for evaluating the validity of measurements;
4. To summarise proportional, 2-term and 3-term process control and hence select and apply transducers to process control. *(KS 1, 3)*

Key skills for employability

1. Written, oral and media communication skills,
2. Leadership, team working and networking skills
3. Opportunity, creativity and problem solving skills
4. Information technology skills and digital literacy
5. Information management skills
6. Research skills
7. Intercultural and sustainability skills
8. Career management skills
9. Learning to learn (managing personal and professional development, self management)
10. Numeracy

Assessment:

Please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%). ***Details of indicative assessment should also be included****.*

Assessment is 100% in-course. Assessment is by means of an in-class test covering all outcomes. It is an unseen time-constrained test.
(This corresponds to 'Assessment 1' of ENG555.)

Assessment number (use as appropriate)	Learning Outcomes met	Type of assessment	Weighting	Duration (if exam)	Word count (if coursework)
Assessment One:	1, 2, 3	In-class Test	100%	2hrs	

Learning and Teaching Strategies:

The 'Instrumentation and process control' will be delivered through lectures supported by pre-written notes, tutorials and laboratory exercises. Practical work will take up approximately 30% of the time allocated to this component. Where possible, industrial visits to observe different process applications will be included.

Syllabus outline:

Description of Physical Variables: linear and angular displacement, velocity, strain, flow, level, etc.. Selection of appropriate transducers for above with signal conditioners where required.
Sources of error in measurement systems: Accuracy, precision, hysteresis, zero shift,resolution, linearity, sensitivity. Maximum possible and probable errors. Response and dead time.
Transducers: potentiometers, optical encoders, variable reactance transducers, piezo-electric devices, dc and ac tachogenerators, synchro resolvers.
Measurement techniques: force, pressure and strain: application of atmospheric and absolute pressure - gas laws - to industrial measurement problems; strain gauges, diaphragm, piezo-electric, Hall effect transducers.
Measurement of flow: volumetric and mass flow; variable gate, turbine, electro-magnetic.
Measurement of temperature: absolute/celsius scales; RTD, thermistor, thermocouple.
Optical intensity measurement: definition of variables; photo-conductive, photo-voltaic devices.
Proximity detectors: Inductive, capacitive and optical. Factors affecting range and discrimination.
Comparison of the Measurement Techniques: analysis of performance parameters of the measurement techniques - for each of the physical variables listed above - in terms of accuracy, resolution, sensitivity and repeatability. Selection of appropriate components for a given measurement system.
Process control: Proportional, Integral, and derivative action. Process response curve and tuning. Application of transducers.
Case studies of industrial applications and subject-relevant systems. Selection of appropriate components for a given measurement system.

Bibliography

Essential Reading:
Morris, A.S. (2006) *Measurement and Instrumentation Principles*, Butterworth-Heinemann.

Recommended reading:
Dunn, W.C. (2005) *Fundamentals of Industrial Instrumentation and Process Control*, McGraw-Hill.
Altmann, W. (2005) *Practical Process Control for Engineers and Technicians*, London: Newnes.
Dunn, W.C. (2005) *Fundamentals of Industrial Instrumentation and Process Control*, London: McGraw Hill Higher Education.