Wrexham glyndŵr UNIVERSITY

MODULE SPECIFICATION PROFORMA

Module Title:	**Industrial Data and Network Design**	**Level**:	5	**Credit Value**:	20

Module code:	ENG546	**Is this a new module?**	Yes	**Code of module being replaced**:	

Cost Centre:	GAME	**JACS3 code**:	H131

Trimester(s) in which to be offered:	1, 2 & 3	**With effect from:**	September 16

School:	Applied Science, Computing & Engineering	**Module Leader:**	James Robinson

Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
FdEng Industrial Engineering	☐	✓

Pre-requisites
None

Derogations
A derogation from regulations has been approved for this module which means that whilst the pass mark is 40%, each element of assessment requires a minimum mark of 30% for the module to be passed overall.

Office use only

Initial approval June 16

APSC approval of modification *Enter date of approval* Version 1

Have any derogations received SQC approval? Yes ✓ No ☐

Module Aims
To develop knowledge and understanding of the concepts, protocols, media types, software and methods involved with industrial networking and data acquisition systems and software.

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	Analyse several industrial network protocols and systems	KS4	
2	Demonstrate an understanding the principles behind different methods of data transmission and the media used to achieve this	KS5	
3	Design, interface and commission Industrial networks such that data can be passed between PLCs	KS6	
		KS9	
4	Identify frame faults and data corruption using a Protocol analyser	KS3	

Assessment:

Assessment 1 - The Lab Report will detail the practical work the student has achieved which would have involved the design, development, implementation and commissioning of a SCADA HMI system. This should be seen to be of a professional standard and utilise several of the advanced functions and methods of software development.

Assessment 2 - The second assessment will be a research report where the student would be guided to investigate certain aspects of industrial network systems.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	2,3 & 4	Report	50		2000
2	1	Report	50		2000

Learning and Teaching Strategies:

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

Laboratory work – A series of experiments embedding principles with practical considerations will be implemented. The experiments would involve data transfer between PLC to other PLCs and PC to /from PLCs and LOIs utilising one or more, of the industrial network systems. This will be further developed, including software familiarisation, to incorporate SCADA / HMI functionality.

Syllabus outline:

- Industry standards: OSI layers, RS232, RS485, CIP (common industrial protocol white paper 2001);
- Network types: Define several different network types, for example - Profibus, DH+, Industrial Ethernet, ASi, ControlNet, DeviceNet, etc;
- Hierarchy: Examine - topologies, LAN, WAN, token passing, system distribution etc. Also identify the suitability of the above network types and their place in a hierarchical system;
- System integration: Define control strategies (use case studies where appropriate) Devices, networks and software integration, to include PLCs, SCADA, HMIs/MMIs/LOIs, intelligent sensors, MS Office;

- Data transmission and telemetry: To include media types (fibre optic, different cabling, wireless, microwave), data packet construction (and difference between network types), devices (repeaters, gateways etc.) Carrier signals etc;
- Programme structure – use of, and potential problems associated with, sub-routines. Allocation of file/bit addresses, in an organised manner to allow for future modification and data transfer between devices;
- Advanced functionality of PLC – indirect addressing methods, indexed addressing methods, multiplexing data inputs, etc;
- SCADA – Develop an understanding of communication methods and data transfer. Graphical displays and 'on screen menus'. Exporting data and trending process variables;
- LOIs – Appreciate the functions of LOIs and methods of interfacing with the control system, consideration should be given to security and access levels.

Bibliography:

Essential reading

Reynders, D. et al. (2004)*Practical Industrial Data Communications: Best Practice Techniques*, Newnes

Other indicative reading

Mackey, S. et al. (2004)*Practical Industrial Data Networks: Design, installation and troubleshooting*, Newnes
Bailey, D. (2003) *Practical SCADA for Industry*, IDC Technologies