

Module specification

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Module Code	ENG5C8
Module Title	Industrial Communication Protocols
Level	5
Credit value	20
Faculty	FACE
HECoS Code	100164
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Electrical Engineering	Core

Breakdown of module hours

Learning and teaching hours	24 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	24 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	48 hrs
Placement hours	0 hrs
Guided independent study hours	152 hrs
Module duration (Total hours)	200 hrs

Module aims

This module develops applied understanding through a balance of theory and practice. Learners undertake both classroom study and supervised practical activity to explore design, implementation, and evaluation processes. Collaborative work and enquiry-based learning foster communication, teamwork, and the confidence to apply problem-solving techniques in varied contexts.

This module aims to develop students' understanding of industrial communication protocols, equipping them with the knowledge and skills required to analyse, apply, and evaluate industrial

communication systems, with particular emphasis on reliability, robustness, and security in safety-critical industrial environments.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Analyse the principles and operational characteristics of industrial communication protocols within automated systems.
2	Apply and compare communication architectures to assess interoperability, performance, and reliability in industrial networks.
3	Evaluate technical literature, standards, and emerging technologies to inform decisions on protocol selection and system design for complex industrial scenarios.

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1: Coursework

Students will complete a structured written report that critically evaluates industrial communication systems employing specified communication protocols. The assessment requires analysis of protocol performance, interoperability, and suitability for defined industrial scenarios.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Coursework	3000	100	N/A

Derogations

Credits shall be awarded by an Assessment Board for those modules in which a pass mark 40% has been achieved, with a minimum mark of 30% in each assessment element.

Learning and Teaching Strategies

Learning integrates conceptual study with practical investigation to deepen understanding and enhance problem-solving ability. Students participate in lectures, laboratory work, and team-based projects that encourage collaboration and communication. Online materials, recordings, and discussion forums support blended engagement. Tutorials promote reflective learning and increasing autonomy in preparation for advanced study.

Welsh Elements

This module will be delivered through the medium of English; however, students have the option to submit their assessments in the medium of Welsh. While this module is not currently offered fully through Welsh, Welsh language support and guidance are available, and some learning materials or tutorial discussions may incorporate Welsh elements where appropriate. To further promote bilingual learning, all students have the opportunity to take the 20-credit *Welsh for STEM* short course, designed to develop confidence and subject-specific language skills in both English and Welsh.

Indicative Syllabus Outline

Industrial Communication Protocols Overview: Analysis of the fundamental principles, operational characteristics, and use cases of industrial communication protocols.

Protocol Functionality and Behaviour: Examination of data exchange mechanisms, determinism, timing behaviour, and functional capabilities of protocols within automated industrial environments.

Network Architecture and System Integration: Application and comparison of industrial communication architectures, considering protocol selection, system integration, and interoperability within complex industrial networks.

Performance and Reliability Analysis: Assessment of network performance and reliability using appropriate evaluation techniques, including analysis of latency, fault tolerance, security, and scalability.

Use of Standards and Technical Literature: Critical evaluation of international standards (e.g. IEC standards, OPC specifications) and scholarly sources to justify protocol selection and design decisions.

Emerging Technologies and Future Developments: Evaluation of emerging communication technologies and trends to inform robust, future-proof system design for complex industrial scenarios.

Indicative Bibliography

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads:

RealPars, “Industrial Networks”, YouTube Playlist, 2020. [Online]. Available:
https://www.youtube.com/watch?v=OZPLOMj_M6U&list=PLIn3BHg93SQ9BLnQy091oU6pGcMWdY0PX

Other indicative reading:

E. D. Knapp and J. T. Langill, *Industrial Network Security, 3rd ed.: Securing Critical Infrastructure Networks for Smart Grid, SCADA, and Other Industrial Control Systems*. Burlington, MA: Syngress Publishing, 2024.

J.S. Rinaldi and G. Workman, *The Everyman's Guide to Properly Architecting EtherNet/IP Networks*. Annapolis, MD: Real Time Automation, Inc., 2022.

J. S. Rinaldi and W. P. Lydon, *Modbus: The Everyman's Guide to Modbus*. Brookfield, WI: Real Time Automation, Inc., 2015

Administrative Information

For office use only	
Initial approval date	June 2026
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Date and details of revision	
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