MODULE SPECIFICATION

Module Code:	ENG6AB

Module Title:	Industrial Communication Systems

Level:	6	**Credit Value:**	20

Cost Centre(s):	GAME	JACS3 **code**: HECoS code:	H640 100159

Faculty	FAST	**Module Leader:**	S Shoaib

Scheduled learning and teaching hours	36 hrs
Guided independent study	164 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) Production Engineering	✓	☐
BEng (Hons) Industrial Engineering Design (Electrical & Electronic)	✓	☐

Pre-requisites

Office use only
Initial approval: 11/09/19 Version no:1
With effect from: 11/09/19
Date and details of revision: Version no:4
30/01/20 admin update of derogation
12/8/20 Temporary change to assessment for 2020/21 post Covid.
22/9/21 Temporary change to assessment extended for 21/22

Module Aims
The module aims to develop in-depth knowledge and skills on industrial data networks enabling students to plan, implement and troubleshoot data communication solutions, and to develop students' ability to synthesise information from a variety of sources in order to characterise and evaluate digital communication systems and to fulfil industrial requirements.

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	Systematically demonstrate the practical implementation of the theoretical engineering concepts.	KS2	KS3
		KS10	
2	Identify, critically analyse and communicate the potential technical problems in the industrial communication system to the stake holders.	KS1	KS5
		KS8	KS9
3	Critically evaluate the performance, research and provide solution to a complex engineering problem using the available tools and equipment in the laboratory and the work place.	KS3	KS6
4	Define the synthesis of significant installations of the communication systems in industry through applied knowledge and practical skills to maintain a secure control of the physical processes in the infrastructure.	KS2	KS5
		KS8	KS9

Transferable skills and other attributes

Communication skills
Evaluation and analysis skills
Research skills
Time Management 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 One: A written examination of 3 hours duration at the end of the module to assess a complete understanding of the contents of the module. This will be a comprehensive paper composed of multiple questions and complex engineering problem(s).

Assessment Two: A course work of minimum 2500 words count will be submitted to assess practical skills. This will be composed of the reports of all the laboratory sessions in which practical work was performed during the module.

Post Covid-19 Temporary modification valid for 20/21 and 21/22:

Assessment One: A portfolio of work covering assignment based tasks covering learning outcomes 2,3 and 4. Examples of assessment may include practical based laboratory work, case study investigation, electrical engineering design calculations and multiple choice quizzes via the module VLE site.

Assessment Two: As above

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration or Word count (or equivalent if appropriate)
1	2,3,4	Examination	50	3 hours
2	1	Coursework	50	2500
Post Covid-19 Temporary modification valid for 20/21 and 21/22:				
1	2,3,4	Portfolio	50	2500
2	1	Coursework	50	2500

Learning and Teaching Strategies:

The module will be presented to the students in the form of lectures and practical demonstrations. The tutor will give the necessary theoretical knowledge to the students and the students will then implement practically to corroborate the theoretical knowledge. Where possible, visits to industries will be arranged to demonstrate the operation of actual communication systems. Relevant videos and tutorials will also be used to support the learning process. Practical exercises will be devised to enhance the students' technical and team working skills.

Syllabus outline:

Analog Communication: Amplitude Modulation, Frequency Modulation and Phase Modulation, Pulse Modulation, Transmitters, Receivers, Transducers

Digital Communication: ASK, PSK, FSK.

Digital Communication: Analog to Digital Convertor, Digital to Analog Convertor, Digital Modulation

Radio Communication: Wave Propagation through wired and wireless media, Antennas, RFID, Near field and Far field communication, 2G, 3G, 4G and 5G and Beyond 5G future communications, automation and wireless data transfer, Radar and Satellite Communication, Optical fibre communication.

Optical Fibre Communication: System components, Modulation and demodulation of light. Operating frequency. Ray theory transmission, Graded index fibres.

Industrial Data Communication systems: An analysis of current and possible future technologies. Typically this may include systems such as Profi-Bus, Profi – Net, ASI bus etc.

Indicative Bibliography:

Essential reading

Lathi, B. P & Ding, Z (nd.) Modern Digital and Analog Communication, 4th ed

Other indicative reading

Fundamentals of Communication Systems," 1st Edition by Jonh G Proakis, Masoud Salehi.

D. Reynders (2005) Practical Industrial Data Communications, Butterworth-Heinemann

Antennas and Wave propagation by John D. Kraus, 4th Edition

Kolawole, M.O. (2017), *Satellite Communication Engineering*.
2nd ed. Boca Raton, FL: CRC Press.

Skolnik, M.I. (ed.) (2008), *Radar Handbook*. 3rd ed.
Maidenhead: McGraw Hill.

Optical Fiber Communications Principles and Practice, Third Edition, John M. Senior

Mackay, S. et al. (2004), *Practical Industrial Data Networks: Design, Installation and Troubleshooting*. Oxford: Newnes.