

## Module specification

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|              |                                  |
|--------------|----------------------------------|
| Module Code  | ENG6AB                           |
| Module Title | Industrial Communication Systems |
| Level        | 6                                |
| Credit value | 20                               |
| Faculty      | FAST                             |
| HECoS Code   | 100159                           |
| Cost Code    | GAME                             |

### Programmes in which module to be offered

| Programme title                                         | Is the module core or option for this programme |
|---------------------------------------------------------|-------------------------------------------------|
| BEng Industrial Engineering (Electrical and Automation) | Core                                            |
| BEng Industrial Engineering (Mechatronics)              | Core                                            |

### Pre-requisites

None

### Breakdown of module hours

|                                                                      |         |
|----------------------------------------------------------------------|---------|
| Learning and teaching hours                                          | 36 hrs  |
| Placement tutor support                                              | 0 hrs   |
| Supervised learning e.g. practical classes, workshops                | 0 hrs   |
| Project supervision (level 6 projects and dissertation modules only) | 0 hrs   |
| <b>Total active learning and teaching hours</b>                      | 36 hrs  |
| Placement / work based learning                                      | 0 hrs   |
| Guided independent study                                             | 164 hrs |
| <b>Module duration (total hours)</b>                                 | 200 hrs |

|                            |          |
|----------------------------|----------|
| <b>For office use only</b> |          |
| Initial approval date      | 11/09/19 |
| With effect from date      | 11/09/19 |

| For office use only          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date and details of revision | 30/01/20 admin update of derogation<br>12/8/20 Temporary change to assessment for 2020/21 post Covid.<br>22/9/21 Temporary change to assessment extended for 21/22<br>Sept 22 Template update via Engineering revalidation, addition of BEng Industrial Engineering top up programmes<br>07/03/2022 AM0 Realignment of assessments and learning outcomes<br>Sept 26: Removal of BEng Production Engineering and BEng Industrial Engineering Design (Electrical & Electronic) |
| Version number               | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 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.

## Module Learning Outcomes - at the end of this module, students will be able to:

|   |                                                                                                                                                                                                                         |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Systematically demonstrate the practical implementation of the theoretical engineering concepts.                                                                                                                        |
| 2 | Identify, critically analyse and communicate the potential technical problems in the industrial communication system to the stake holders.                                                                              |
| 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.                                       |
| 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. |

In addition to the module learning outcomes, students will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: C3 & C4 for BEng degree apprenticeship programmes and B3 & B4 for BEng Industrial Engineering Level 6 top-up programmes.

## 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 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 simulations and/or practical work was performed during the module.

| Assessment number | Learning Outcomes to be met | Type of assessment | Weighting (%) |
|-------------------|-----------------------------|--------------------|---------------|
| 1                 | 2                           | Examination        | 50            |
| 2                 | 1, 3, 4                     | Coursework         | 50            |

## 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%.

## 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.

## Indicative Syllabus Outline

**Communication and Networking: OSI Model, TCP/IP, IP Addressing, Analog and Digital Communication.**

**Industrial Data Communication:** Copper Cable, Fibre Optics, RS-232, RS-485, Modbus, Industrial Ethernet, Field Bus, Profibus, Profinet, HART Protocol.

**Wireless Communication:** Wireless Technologies, 3G, 4G, 5G, LTE, Bluetooth, ZigBee, etc.

## Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update. Please *ensure correct referencing format is being followed as per University Harvard Referencing Guidance*.

### Essential Reads

B. P. Lathi and Z. Ding, *Modern Digital and Analog Communication*, 4th ed. New York: Oxford University Press, 2010.

### Other indicative reading

J. Proakis and M. Salehi, *Fundamentals of Communication Systems*. 2<sup>nd</sup> ed. Boston: Pearson, 2014.

- D. Reynders, et. al., *Practical Industrial Data Communications*. Boston: Elsevier, 2005.
- J. Kraus, et. al., *Antennas and Wave propagation*. 4<sup>th</sup> ed. McGraw Hill, 2010.
- M. Kolawole, *Satellite Communication Engineering*. 2nd ed. FL: CRC Press, 2017.
- M. Skolnik, *Radar Handbook*. 3rd ed. Maidenhead: McGraw Hill, 2008.
- J. Senior and M. Jamro, *Optical Fiber Communications Principles and Practice*. 3<sup>rd</sup> ed. Harlow: Financial Times/Prentice Hall, 2009.
- S. Mackay, et al., *Practical Industrial Data Networks: Design, Installation and Troubleshooting*. Oxford: Newnes, 2004.

## **Employability skills – the Glyndwr Graduate**

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Each module and programme is designed to cover core Glyndwr Graduate Attributes with the aim that each Graduate will leave Glyndwr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

### **Core Attributes**

Engaged  
Enterprising  
Creative  
Ethical

### **Key Attitudes**

Commitment  
Curiosity  
Resilience  
Confidence  
Adaptability

### **Practical Skillsets**

Digital Fluency  
Organisation  
Leadership and Team working  
Critical Thinking  
Emotional Intelligence  
Communication