

## MODULE DESCRIPTOR

### Module Title

Sensor Networks and Data Transfer

Reference	EN2106	Version	5
Created	April 2023	SCQF Level	SCQF 8
Approved	July 2018	SCQF Points	30
Amended	August 2023	ECTS Points	15

### Aims of Module

To provide the student with the knowledge and skills to design and analyse complete sensor networks including signal communications and data transfer.

### Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Infer fundamental principles of communication signals, modulation schemes and transmission systems and channels.
- 2 Show simple digital and analogue based telecommunication systems.
- 3 Compare technical literature to address the different communications methods available for a transmitter and a complete sensor network.
- 4 Use the elements of a SCADA system, its functionality, speed of response, constraints, power requirements, how it interfaces to a process and other control systems.
- 5 Adopt a holistic and proportionate approach to the mitigation of security risks.
- 6 Show the impact of noise in data transmission in practical laboratory setting.

### Indicative Module Content

Sensors and physical principles of measurement, Signal transmission and conversion, SCADA and IT security, Telemetry systems. HART, Foundation Fieldbus, Wireless. The use of symmetry. Amplitude spectra. Radio, satellite, wireless and Ethernet communication. Cable design, analogue and digital signalling, interference, voltage control, impedance. Fibre optic cable design, HART and fieldbus. Developing a cable schedule.

### Module Delivery

The module is delivered in Blended Learning mode using structured online learning materials/activities and directed study, facilitated by regular online tutor support. Workplace Mentor support and work-based learning activities will allow students to contextualise this learning to their own workplace. Face-to-face engagement occurs through annual induction sessions, employer work-site visits, and modular on-campus workshops.

Indicative Student Workload	Full Time	Part Time
Contact Hours	30	N/A
Non-Contact Hours	30	N/A
Placement/Work-Based Learning Experience [Notional] Hours	240	N/A
TOTAL	300	N/A
Actual Placement hours for professional, statutory or regulatory body	240	

## ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

### Component 1

Type:	Coursework	Weighting:	50%	Outcomes Assessed:	1, 2, 6
Description:	Case study report				

### Component 2

Type:	Coursework	Weighting:	50%	Outcomes Assessed:	3, 4, 5
Description:	Case study report				

## MODULE PERFORMANCE DESCRIPTOR

### Explanatory Text

The module has 2 components and to gain an overall pass a minimum D grade must be achieved in each component. The component weighting is as follows: C1 is worth 50% and C2 is worth 50%.

		Coursework:						
		A	B	C	D	E	F	NS
Coursework:	A	A	A	B	B	E	E	
	B	A	B	B	C	E	E	
	C	B	B	C	C	E	E	
	D	B	C	C	D	E	E	
	E	E	E	E	E	E	F	
	F	E	E	E	E	F	F	
	NS	Non-submission of work by published deadline or non-attendance for examination						

## Module Requirements

Prerequisites for Module	Completion of Stage 1, SCQF Level 7, or equivalent.
Corequisites for module	None.
Precluded Modules	None.

**INDICATIVE BIBLIOGRAPHY**

- 1 HENDERSON, T. C., 2009. Computational Sensor Networks. New York : Springer
- 2 TOUATI, Y, DAACHI B, ARAB, A.C. Energy management in wireless sensor networks. 2017. London:ISTE Press:Elsevier.
- 3 LOVE, J. Process Automation Handbook: A guide to Theory and Practice. 2007.
- 4 FRADEN, J, 2016 Handbook of Modern Sensors, 5th ed. Springer
- 5 HAYKIN, S. and MOHER, M., 2009. Communications Systems. 5th ed. Hoboken, NJ: John Wiley & Sons.
- 6 OPPENHEIM, A.V.,WILLSKY, A.S. and HAMID, S. 2013. Signals and Systems. 2nd ed. Harlow: Pearson.