

MODULE DESCRIPTOR

Module Title

Controls, Instrumentation and Integrated Systems

Reference	ENM281	Version	2
Created	August 2021	SCQF Level	SCQF 11
Approved	January 2018	SCQF Points	15
Amended	August 2021	ECTS Points	7.5

Aims of Module

The aim of the module is to investigate the use of fundamental principles and advanced techniques in control and instrumentation, and identify the challenges of integration of offshore based systems.

Learning Outcomes for Module

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

- 1 Analyse the synthesis of signals from process variables in terms of their generation, processing, analysis and transmission.
- 2 Demonstrate critical awareness of telemetry, robotics, remotely controlled underwater vehicle (ROV), programmable logic controller (PLC) and their utility to solve industrial problems.
- 3 Use a range of specialist tools and techniques to predict processes over short and long terms.
- 4 Critically analysing the challenges of offshore operation, evaluate the usefulness of Self Monitoring And Reporting Technology (SMART) and integrated control systems.
- 5 Demonstrate specialist knowledge of sensors, transducers, actuators and control systems by designing an application to solve an industrial problem.

Indicative Module Content

Overview of signal synthesis in terms of their generation, processing, analysis and transmission. Offshore based communication techniques including underwater communication. Telemetry, Sonar, Acoustic Communication. Remotely Operated Underwater Vehicle (ROV). Control of ROV and AUV. Programmable Logic Controller (PLC). Advanced Control Techniques (like Model Predictive Controller), Discrete Event control and PLC, Hardware-in-a-loop simulation. Programmable-Integral-Derivative (PID) tuning and implementation issues (Digital PID and integral windup). Techniques to predict complex processes using concepts of data visualisation, simulation, localisation and analytical methods. Climatology, Numerical Weather Prediction (NWP). Use strategies to predict weather, storm, wind, hurricanes, precipitation, pressure gradient and temperature. Concept of Integrated Control. Use of sensors and actuators. Sensors - Corrosion, depth, flow, pH, phytoplankton, cable, Hall, wave front, calorimeter. Use of optical, electrical, mechanical, biological, and chemical sensors in offshore locations. Signal transmission, command and control units. Supervisory Control and Data Acquisition (SCADA) systems, IEC60870 standards. Distributed Control Systems (DCS) and protocols, like FieldBus, CANBus. Security, Self Monitoring And Reporting Technology (SMART). Case studies of offshore integrated systems (Tele-control and remote monitoring)

Module Delivery

This module will be delivered full time and by distance learning. The module is taught through lectures and lab sessions.

Indicative Student Workload

	Full Time	Part Time
Contact Hours	60	60
Non-Contact Hours	90	90
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	150
<i>Actual Placement hours for professional, statutory or regulatory body</i>		

ASSESSMENT PLAN

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

Component 1

Type:	Coursework	Weighting:	30%	Outcomes Assessed:	5
Description:	Report.				

Component 2

Type:	Examination	Weighting:	70%	Outcomes Assessed:	1, 2, 3, 4
Description:	Closed book examination.				

MODULE PERFORMANCE DESCRIPTOR**Explanatory Text**

The module has 2 components and an overall grade D is required to pass the module. The component weighting is as follows: C1 is worth 30% and C2 is worth 70%.

		Coursework:						
		A	B	C	D	E	F	NS
Examination:	A	A	A	B	B	B	E	
	B	B	B	B	C	C	E	
	C	B	C	C	C	D	E	
	D	C	C	D	D	D	E	
	E	D	D	D	E	E	E	
	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 None.

Corequisites for module None.

Precluded Modules None.

INDICATIVE BIBLIOGRAPHY

- 1 YAN, R., CHEN, X. and MUKHOPADHYAY, S.C., 2017. Structural Health Monitoring: An Advanced Signal Processing Perspective (Vol. 26). Springer.
- 2 SINCLAIR, I., 2000. Sensors and transducers. Newnes.
- 3 JOHNSON, M.A., MORADI, M.H. and CROWE, J., PID control: new identification and design methods, 2005.
- 4 CAMACHO, E.F. and BORDONS, C., 1999. Model predictive control (advanced textbooks in control and signal processing).
- 5 CLARKE, G.R., REYNDERS, D. and WRIGHT, E., 2004. Practical modern SCADA protocols: DNP3, 60870.5 and related systems. Newnes.
- 6 WOODS, A., 2006. Medium-range weather prediction: The European approach. Springer Science & Business Media.