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MODULE DESCRIPTOR

Module Title

Controls, Instrumentation and Integrated Systems

Reference	ENM281	Version	1
Created	September 2017	SCQF Level	SCQF 11
Approved	January 2018	SCQF Points	15
Amended		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.

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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
Actual Placement hours for professional, statutory or regulatory body		

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:	A written coursework.				

Component 2

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

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MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

In order to pass the module, students should achieve a mark of at least 50% and an overall grade of D or greater.

Module Grade	Minimum Requirements to achieve Module Grade:
A	Greater than or equal to 70%
B	In the range 60% to 69%
C	In the range 55% to 59%
D	In the range 50% to 54%
E	In the range 40% to 49%
F	Less than 40%
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.