MODULE DESCRIPTOR

Module Title

Engineering Analysis B

Reference	EN4108	Version	5
Created	February 2024	SCQF Level	SCQF 10
Approved	December 2020	SCQF Points	30
Amended	April 2024	ECTS Points	15

Aims of Module

To provide the student with the knowledge & skills required to carry out numerical calculation and modelling of complex systems, as well as control and instrumentation systems.

Learning Outcomes for Module

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

1	Examine classical control techniques in the analysis and design of continuous-time control systems.
2	Examine measurement system designs such that the systems meet a given specification.
3	Conceptualise the fundamental principles of modelling and simulation.
4	Execute finite element methods on engineering systems
5	Critique condition monitoring and non-destructive testing techniques as applied to industrial plant.

Indicative Module Content

Open and closed loop control systems, components of control systems, control system performance characteristics, construction of control system. electrical and mechanical system models, first and second order system response, application of computer based tools in signal acquisition, instrumentation and control. Signal types, signal characteristics, sensitivity, calibration. Process Control. Systems modelling, transfer functions, transient and steady state response methods, frequency response methods, stability analysis, state space representation and signal flow graphs. Instrumentation system characteristics including their application and response in noisy electrical environments. The application of specialised measurement systems with examples from process plant eg flow, pressure, temperature and/or level. Some areas of applied measurement: intrinsically safe systems, EMC, PLCs and/or Fieldbus. Modelling and simulation: types of models, mathematical modelling, dimensional analysis, finite element analysis, simulation, static analysis. Finite element process: review of displacement/shape functions, equivalent nodal loading, stiffness matrix, and solution methods. Static analysis, dynamic analysis, explicit dynamic analysis, analysis validation. Introduction to maintenance, breakdown and preventative maintenance, condition monitoring methods. Non-destructive testing methods.

Module Ref:	EN4108 v5

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:	60%	Outcomes Assessed:	1, 2, 5
Description:	Online assessment.				

Component 2

Type:	Coursework	Weighting:	40%	Outcomes Assessed:	3, 4
Description:	Coursework assessment using FEA theory and software.				

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 (y-axis) is worth 60% and C2 (x-axis) is worth 40%.

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

Module Requirements

Prerequisites for Module	Completion of EN3110, EN3101, EN3102, EN3103 or equivalent.
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

1	FAGAN, M.J., 1992. Finite Element Analysis: Theory and Practice. Harlow: Longman.
2	BENTLEY J P, 2004, Principles of Measurement Systems, 4th Ed.Longman. Pearson Prentice Hall.
3	BOLTON, W., 2008, Mechatronics: A multidisciplinary approach. Pearson Prentice Hall.
4	DORF, R. and BISHOP, R., 2011. Modern Control Systems, 12th ed. Pearson.
5	BARRON R., 1996. Engineering Condition Monitoring: Practice, Methods and Applications. Essex, England: Addison Wesley Longman
6	MATLAB Getting Started Guide, Mathworks
7	CORRIOU, J-P, 2017. Process Control. 2nd ed. Springer.
8	MANGEY, R., 2018. Modeling and Simulation in Industrial Engineering. Springer.