MODULE DESCRIPTOR

Module Title

Engineering Analysis 3

Reference	EN5500	Version	6
Created	March 2023	SCQF Level	SCQF 11
Approved	March 2004	SCQF Points	15
Amended	August 2023	ECTS Points	7.5

Aims of Module

To enable the student to understand, analyse and interpret the static and dynamic behaviour of engineering systems using advanced analysis and testing techniques.

Learning Outcomes for Module

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

1	Evaluate dynamic behaviour of beam structures through FE analysis and experimental measurements
2	Evaluate dynamic behaviour of structures from experimental data and experimental modal analysis
3	Appraise shape functions and element formulations for higher order elements such as beams and plates.
4	Apply FE package to model selected structural non-linearities.

Indicative Module Content

Multi-degree-of-freedom lumped parameter and continuous systems: Lagrangian dynamics. Matrix representation. Normal mode analysis. Principle coordinates. Orthogonality. Dealing with damping. Dynamic analysis using FEM: Elemental mass and stiffness matrices. Assembly of global matrices. Eigenvalue extraction. Practical limitations. Experimental modal analysis: Vibration measurement. Signal processing requirements. Excitation techniques. Frequency response function. Modal extraction techniques. Complex modes. Simplifying assumptions. FEM verification. Beam and Plate Elements: Shape Functions. Higher Order Element Formulations. Assembly and Solution of Matrix Equations. Structural Non-linearity using FEM: Inelastic materials. Contact Analysis. Newton-Raphson Method.

Module Delivery

Lectures and tutorials will be utilised to introduce the principal study topics, after which supervised laboratory and student centred case studies will be used to achieve the learning outcomes.

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Indicative Student Workload	Full Time	Part Time
Contact Hours	35	35
Non-Contact Hours	115	115
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:	50%	Outcomes Assessed:	1, 2, 3
Description:	Coursework.				

Component 2

Type:	Coursework	Weighting:	50%	Outcomes Assessed:	4
Description:	Coursework.				

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	None.
Corequisites for module	None.
Precluded Modules	None.

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INDICATIVE BIBLIOGRAPHY

1	CORREA, J., JUAN, C. A., LOZANO GUZMAN, A. A., 2020. Mechanical vibrations and condition monitoring, London : Academic Press, ISBN : 9780128203903
2	SZEIDL, G., KISS, L. P., 2020. Mechanical Vibrations, an introduction. SPRINGER NATURE, ISBN : 9783030450748
3	RAO, SINGIRESU S. 2018. Mechanical vibrations in SI units, 6th Edition, Harlow: Pearson, ISBN : 9781292178615
4	HAN, Q., WEI, J., HAN, Q., ZHANG, H., 2016. Dynamics and Vibration Analyses of Gearbox in Wind Turbine. Singapore : Springer Singapore, ISBN : 9789811027475
5	ZHUMING, B., 2019. Finite Element Analysis Applications: A Systematic and Practical, Academic Press, ISBN 978-0-12-809952-0