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MODULE DESCRIPTOR

Module Title

Failure Analysis

Reference	EN4701	Version	4
Created	August 2021	SCQF Level	SCQF 10
Approved	March 2004	SCQF Points	15
Amended	August 2021	ECTS Points	7.5

Aims of Module

To provide the student with the ability to relate the mechanisms of engineering failures, and methods for their detection, to the incipient and wear-out failure of engineering systems.

Learning Outcomes for Module

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

- 1 Assess the properties of materials and their modes of failure under adverse environmental conditions.
- 2 Apply the relevant analysis and failure criteria to the solution of complex stress systems and determine the fracture toughness, crack growth and creep behaviour of engineering materials.
- 3 Analyse and evaluate typical operational problems in rotating machinery.
- 4 Identify and appraise condition monitoring and non-destructive testing techniques as applied to industrial plant.

Indicative Module Content

Microstructural properties of materials; analysis of microstructures; applications of microstructural analysis to failure mechanisms of materials; dielectric properties and degradation processes. Modelling of complex stress systems; failure analysis; fracture toughness and stress intensity factors; crack growth and material failure mechanisms; creep and creep stress relaxation. Operational problems in rotating machinery; unbalance; misalignment bearing and gear faults; mechanical resonance. Condition monitoring methods including vibration. Non-destructive testing methods including acoustic emission.

Module Delivery

The module is taught using a a balanced programme of lectures, tutorials and self-study. Case studies are used to illustrate industrial applications.

Indicative Student Workload

	Full Time	Part Time
Contact Hours	45	45
Non-Contact Hours	105	105
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:	Examination	Weighting:	30%	Outcomes Assessed:	1
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 30% and C2 is worth 70%.

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

Module Requirements

Prerequisites for Module	Engineering Analysis 1 (EN3501) or equivalent.
Corequisites for module	None.
Precluded Modules	None.

ADDITIONAL NOTES

An Indicative Bibliography will normally reference the latest edition of a text. In some cases, older editions are equally useful for students and therefore, those are the editions that may be stocked.

INDICATIVE BIBLIOGRAPHY

- 1 DOWLING, N.E., 2013. Mechanical Behaviour of Materials. 4th ed. Upper Saddle River, NJ: Prentice Hall.
- 2 HERTZBERG, R.W., 2013. Deformation and Fracture Mechanics of Engineering Materials. 5th ed. New York, NY: Wiley.
- 3 CALLISTER, W.D., 2015. Materials Science and Engineering. 9th ed. New York, NY: Wiley.
- 4 BARRON, R., 1996. Engineering Condition Monitoring: Practice, Methods and Applications. Essex: Addison Wesley Longman.
- 5 ROYLANCE, B.J. and HUNT, T.M., 1999. The Wear Debris Analysis Handbook. Oxford: Coxmoor Publishing Co.
- 6 REEVES, C.W., 1998. The Vibration Monitoring Handbook. Oxford: Coxmoor Publishing Co.