

Module Details	
Module Title	Materials Failure Analysis And Reliability
Module Code	MAE6018-B
Academic Year	2021/2
Credits	20
School	Department of Mechanical and Energy Systems Engineering
FHEQ Level	FHEQ Level 6

Contact Hours	
Type	Hours
Lectures	24
Tutorials	12
Directed Study	164

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1

Module Aims
Failure of components & structures can have catastrophic consequences so knowledge of the various means by which engineering structures can fail is crucial in the design, manufacture & operation of engineering systems. This module builds on core knowledge of materials science & structural mechanics acquired in level 4 & 5 modules & aims to provide the integrated knowledge & skills to; recognise the important failure mechanisms which lead to catastrophic structural failure under static & cyclic - loading to use metallurgical analysis/knowledge to identify failure processes

Outline Syllabus
1) Micro-mechanisms of failure in materials 2) Processes involved in abrasive, adhesive and fretting wear 3) Corrosion mechanisms - Stress corrosion cracking 4) Principles of linear elastic fracture mechanics and application in design to avoid failure 5) Material behaviour under cyclic loading 6) Fatigue and factors that influence fatigue 7) Fracture toughness in materials 8) Ductile-Brittle transitions in metals 9) Wear behaviour in materials 10) Abrasive, erosive and metal wear 11) Archard wear equation

Learning Outcomes	
Outcome Number	Description
01	Evaluate and differentiate between the important failure mechanisms of engineering structures.
02	Identify potential failure modes in engineering components based on design, loading profile, material selection and environmental factors.
03	Apply appropriate fracture mechanics to predict or prevent failure of engineering structures or components subjected to static and cyclic loading.

Learning, Teaching and Assessment Strategy
The course material is delivered through a combination of interactive lectures, small group tutorials. Theory, implementation, application, and critical analysis is gained through both the interactive lectures and the tutorials. Formative assessment will be through the evaluation of , case studies and working through questions in tutorials. Directed study is used to help students to obtain a deeper understanding of the topics covered and provide a wider context. Engineering application and evaluation is gained from supervision of the group projects. Assessment of understanding, application and critical analysis is by both examination (all LOs) and by; assessment of engineering application in the group project (particular focus on LOs 2 and 3). This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Third Edition (AHEP3) as published by The Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify six key areas of learning: Science and Mathematics (SM), Engineering Analysis (EA), Design (D), Economic, Legal, Social, Ethical and Environmental Context (EL), Engineering Practice (P) and Additional General Skills (G). SM1b, SM2b, SM3b, EA1b, EA2, EA3b, EA4b, D3b, EL1, EL2, EL4, EL5, EL6b, P1, P2, P4, P5, P6, P7, P8, P11b, G1, G2, G4, SM1m, SM2m, SM3m, SM4m, SM5m, SM6m, EA1m, EA3m, EA4m, EA6m, D3m, EL1m, EL5m, EL6m, EL7m, P2m. Further details of these learning outcomes can be found at https://www.engc.org.uk/

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Presentation	Group presentation on project report	10%
Summative	Examination - Closed Book	Closed book exam on Materials Failure Analysis	60%
Summative	Coursework - Written	Individual report based on engineering components	30%

Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

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