ES2C8-15 Failure Investigation

21/22

Department
School of Engineering
Level
Undergraduate Level 2
Module leader
Muhammad Khan
Credit value
15
Module duration
10 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

ES2C8-15 Failure Investigation

Module web page

Module aims

This module will investigate the main failure and degradation mechanisms in a range of materials. It will use a number of laboratory techniques such as materialography Non-Destructive Testing to examine these failures in a range of engineering components.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Failure Mechanisms including;
Fatigue
Brittle Fracture
Creep
Corrosion

Design Failure
Investigation methods including;
Optical and Electron Microscopy
Non-Destructive Testing
Social Responsibility
Ethics
Case Studies
Automotive Failures
Crash Investigation
Polymer Product Failures

Learning outcomes

By the end of the module, students should be able to:

- Recognise the main failure mechanisms in a range of engineering materials.
- Link failure mechanisms to variations in materials structure, properties and design in a service context.
- Use a range of laboratory techniques to investigate failures.
- Deduce the failure mechanisms in a range of failed components and present findings
- Understand the importance of social responsibility and ethics in the design of components to avoid failure.

Indicative reading list

Fracture mechanics: integration of mechanics, materials science, and chemistry Wei, Robert Peh-ying. Cambridge University Press. 2010 ISBN 052119489X
Fatigue and fracture: understanding the basics Campbell, F. C. ASM International 2012 ISBN 1615039767
Forensic materials engineering: case studies Lewis, P. R., Reynolds, Ken, Gagg, Colin. CRC Press | c2004. ISBN 0849311829
Forensic engineering investigation Noon, Randall . CRC Press 2001. ISBN 0849309115
To forgive design: understanding failure Petroski, Henry Belknap Press of Harvard University Press 2012. ISBN 9780674065840
Failure analysis case studies: a sourcebook of case studies selected from the pages of Engineering failure analysis Jones, David R. H. Elsevier 1998- 2004. ISBN 0080433383
Case studies in engineering failure analysis, E-Journal, Elsevier Ltd. 2013 ISBN 1118902696

View reading list on Talis Aspire

Subject specific skills

1. Plan and manage the design process, including cost drivers, evaluating outcomes, and working with technical uncertainty
2. Knowledge and understanding of the need for a high level of professional and ethical conduct in engineering and the use of technical literature and other information
3. Ability to apply relevant practical and laboratory skills
4. Knowledge of professional codes of conduct, how ethical dilemmas can arise, relevant legal

and contractual issues.

Transferable skills

1. Apply problem solving skills, information retrieval, and the effective use of general IT facilities
2. Communicate (written and oral; to technical and non-technical audiences) and work with others
3. Plan self-learning and improve performance, as the foundation for lifelong learning
4. Exercise initiative and personal responsibility, including time management, which may be as a team member or leader
5. Overcome difficulties by employing skills, knowledge and understanding in a flexible manner
6. Ability to formulate and operate within appropriate codes of conduct, when faced with an ethical issue
7. Be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.

Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (10%)
Seminars	5 sessions of 2 hours (7%)
Practical classes	3 sessions of 4 hours (8%)
Supervised practical classes	5 sessions of 3 hours (10%)
Other activity	2 hours (1%)
Private study	96 hours (64%)
Total	150 hours

Private study description

96 hrs Guided Independent Learning

Other activity description

1x2 Hours revision class

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time
Group Oral Presentation Group Oral Presentation - Including peer assessment	10%	
Group Written Report (15 pages) Group project work	30%	
ASSIGNMENT ASSIGNMENT	60%	

Feedback on assessment

Formative and summative feedback provided via marksheets for laboratory work.
Cohort level exam feedback provided via examiner’s report and model solutions to examination papers

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Availability

Courses

This module is Option list A for:

- Year 2 of UESA-H335 BEng Automotive Engineering
- Year 2 of UESA-H113 BEng Engineering
- Year 2 of UESA-HN15 BEng Engineering Business Management
- Year 2 of UESA-HH75 BEng Manufacturing and Mechanical Engineering
- UESA-H112 BSc Engineering
    - Year 2 of H112 Engineering
    - Year 2 of H112 Engineering
- Year 2 of UESA-HN11 BSc Engineering and Business Studies
- Year 2 of UESA-H336 MEng Automotive Engineering
- Year 2 of UESA-H114 MEng Engineering
- Year 2 of UESA-HH76 MEng Manufacturing and Mechanical Engineering