UNIVERSITY OF WARWICK

Proposal Form for New or Revised Modules (MA1 - version 7 - April 2014)

Approval information	
Approval Type	New module
Date of Introduction/Change	1 October 2018
If new, does this module replace another? If so, enter module code and title:	
If revised/discontinued, please outline the rationale for the changes:	
Confirmation that affected departments have been consulted:	Changes have been made in consultations between the School of Engineering and WMG

Module Summary	
1. Module Code (if known)	ES2C8
2. Module Title	Failure Investigation
3a. Lead department:	WMG
3b. Teaching Split (if known):	WMG 100%
4. Name of module leader	Barbara Shollock
5. Level	UG: ☐ Level 4 (Certificate) ☒ Level 5 (Intermediate) ☐ Level 6 (Honours) PG: ☐ Level 7 (Masters) ☐ Level 8 (Doctoral) See Guidance Notes for relationship to years of study
6. Credit value(s) (CATS)	15
7. Principal 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.

Module Summary	
8. Principal Learning Outcomes	By the end of the module the student will 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.
9. Timetabled Teaching Activities (summary)	15 x 1 hr lectures 5 x 2 hr seminars 3 x 4 hr labs 5 x 3 hr supervised group project 1 x 2 hr revision class **Total: 54 hrs**
10. Departmental Web-link	http://www2.warwick.ac.uk/fac/sci/eng/eso/modules/year2/
11. Other essential notes	Advice and feedback hours are available for answering questions on the lecture material, the project and past examination questions.
12. Assessment methods (summary)	60% examination 10% Group oral presentation including peer assessment 30% Group written report, including peer assessment – 15 pages

For use by Strategic Planning and Analytics Office only - Do not fill in this section

Level	JACS3 Code	Teaching Split
		If not provided in 3b above

External Credit Level		Scheme	

Module Context

13. Please list all departments involved in the teaching of this module. If taught by more than one department, please indicate percentage split.

WMG 100%

14. Availability of module

Degree Code	Title	Study Year	C/OC/ A/B/C	Credits
H113	BEng Engineering	2	B	15
H335	MEng Engineering	2	B	15
H336	BEng Automotive Engineering	2	A	15
H335	MEng Automotive Engineering	2	A	15
HH35	BEng Systems Engineering	2	Option C	15
HH31	MEng Systems Engineering	2	Option C	15
HH75	BEng Manufacturing and Mechanical Engineering	2	A	15
HH76	MEng Manufacturing and Mechanical Engineering	2	A	15
HN11	BSc Engineering and Business Studies	2	B	15
HN15	BEng Engineering Business Management	2	A	15

15. Minimum number of registered students required for module to run

20

16. Pre- and Post-Requisite Modules

Module Content and Teaching

17. Teaching and Learning Activities *(totals for module – please see guidance)*

Module duration (weeks)	**10**
Lectures	**15 x 1 hr**
Seminars	**5 x 2 hrs**
Tutorials	
Project Supervision	
Demonstration	
Practical Class/Workshops	3 x 4 hour laboratory class
Supervised time in studio/workshop	5 x 3 hours supervised project
Fieldwork	
External visits	

Module Content and Teaching		
Work based learning		
Placement		
Year abroad		
Other activity *(please describe): e.g. distance-learning, intensive weekend teaching etc.*	**1 x 2 hr revision class** **Guided Independent Learning 96 hrs**	
18. Assessment Method (Standard)		
Type of assessment	**Length**	**% weighting**
Written Examinations	2 Hours	**60**
Practical Examinations	Hours	
Assessed essays/coursework	Group Oral Presentation, including peer assessment Group written report, including peer assessment – 15 pages	**10** **30** **0**
18a. Final chronological assessment *(please see guidance*)	Examination	

19. Methods for providing 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
20. Outline Syllabus
<u>Failure Mechanisms</u> including; Fatigue Brittle Fracture Creep Corrosion **<u>Design Failure</u>** **<u>Investigation methods</u>** including; Optical and Electron Microscopy Non-Destructive Testing

Social Responsibility

Ethics

Case Studies

Automotive Failures

Crash Investigation

Polymer Product Failures

21. Illustrative Bibliography

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

22. Learning outcomes

Successful completion of the module leads to the learning outcomes. The learning outcomes identify the knowledge, skills and attributes developed by the module.

Learning Outcomes should be presented in the format "By the end of the module students should be able to..." using the table at the end of the module approval form:

Resources

23. List any additional requirements and indicate the outcome of any discussions about these.

None

Approval	
24. Module leader's signature	Barbara Shollock
25. Date of approval	Teaching Policy Committee Chair's Action 4 April 2017
26. Name of Approving Committee (include minute reference if applicable)	School of Engineering and WMG Teaching Policy Committee
27. Chair of Committee's signature	Professor Gill Cooke
28. Head of Department(s) signature	Professor Nigel Stocks

Examination Information		
A1. Name of examiner (if different from module leader)		
A2. Indicate all available methods of assessment in the table below		
% Examined	**% Assessed by other methods**	**Length of examination paper**
60	10% Group Oral Presentation, including peer assessment 30% Group written report, including peer assessment – 15 pages	**2 hrs**
A3. Will this module be examined together with any other module (sectioned paper)? If so, please give details below.		
No		
A4. How many papers will the module be examined by?	**X** 1 paper ☐ 2 papers	
A5. When would you wish the exam take place (e.g. Jan, April, Summer)?	**Summer**	
A6. Is reading time required?	☐ Yes ☒ No	
A7. Please specify any special exam timetable arrangements.		
A8. Stationery requirements		
No. of Answer books?	**1**	
Graph paper?	**Yes**	
Calculator?	**Yes**	
Any other special stationery requirements (e.g. Data books, tables etc)?	**Engineering Data Book**	
A9. Type of examination paper		
Seen?	☐ Yes X No	
Open Book?	☐ Yes X No	

Examination Information	
Restricted?	☐ Yes X No
If restricted, please provide a list of permitted texts:	

LEARNING OUTCOMES		
(By the end of the module the student should be able to....)	**Which teaching and learning methods enable students to achieve this learning outcome? (reference activities in section 15)**	**Which summative assessment method(s) will measure the achievement of this learning outcome? (reference activities in section 16)**
Recognise the main failure mechanisms in a range of engineering materials.	Lectures, group work and discussion. Laboratories	Written group report and oral presentation. Laboratories and Examination.
Link failure mechanisms to variations in materials structure, properties and design in a service context.	Lectures, group work and discussion. Laboratories	Written group report and oral presentation. Laboratories and Examination.
Use a range of laboratory techniques to investigate failures.	Lectures, group work and discussion. Laboratories	Written group report and oral presentation. Laboratories and Examination.
Deduce the failure mechanisms in a range of failed components and present findings .	Lectures, group work and discussion. Laboratories	Written group report and oral presentation. Laboratories and Examination.
Understand the importance of social responsibility and ethics in the design of components to avoid failure.	Lectures, group work and discussion. Laboratories	Written group report and oral presentation. Laboratories and Examination.