

Module Code	MEU44B02
Module Name	Forensic Materials Engineering
ECTS Weighting¹	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	David Taylor
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. List and describe the various types of mechanical failure which occur in components, explaining the appearance of fracture surfaces and other relevant evidence which allows the mechanism to be diagnosed. LO2. List the various common causes of failure in engineering components and explain how components are designed so as to prevent failure. LO3. Conduct a failure investigation, as part of a team, to determine the mechanism and cause of a failure; write an appropriate report of the type used by expert witnesses in court. LO4. Determine the stress intensity of a cracked body under load and use this information to predict brittle fracture and fatigue. Estimate the fatigue strength of a structure given results from stress analysis and other relevant information. Use damage mechanics to predict failure under creep and creep/fatigue situations. LO5. Understand the importance of legal and ethical aspects of engineering failures, the significance of codes of practice and standards, the need for safe working practices and the responsibilities of the forensic engineer. Graduate Attributes: levels of attainment To act responsibly - Attained To think independently - Attained To develop continuously - Attained To communicate effectively - Attained

¹ [TEP Glossary](#)

Module Content

This module aims to advance the student's knowledge of the mechanical properties of materials, especially in respect of the principal modes of failure of engineering components, in the context of forensic investigations. The module will be taught through a series of real-life legal cases involving material failure, giving the student experience of failure analysis and of the related methods of design and material selection as well as legal and ethical aspects relating to the preparation of reports and the giving of evidence in court.

Teaching and Learning Methods

This module is taught through a series of case studies, putting the student in the position of a forensic engineer conducting a failure analysis. Theory is introduced as required to solve particular cases. A laboratory exercise gives the student hands-on experience of examining failed items and writing a report for legal purposes. Lectures are given on the Irish legal system and European defective product legislation.

COVID CONTINGENCY: In the event of restrictions due to COVID, lectures tutorials, tests and examinations may be held online, and the laboratory exercise may be replaced with an assignment.

Assessment Details² Please include the following: • Assessment Component • Assessment description • Learning Outcome(s) addressed • % of total • Assessment due date	Assessment Component	Assessment Description	LO Addressed	% of total	Week due
	In Class Tests	Short tests to evaluate ongoing learning	1-4	10%	Various
	Assignment	Product liability (group report)	3,5	10%	Week 8
	Laboratory	Failure Analysis	All	10%	Various
	Final Assignment	Written assignment	All	70%	Week 12
Reassessment Requirements	Supplemental Examination				
Contact Hours and Indicative Student Workload²	Contact hours: 36				
	Independent Study (preparation for course and review of materials): 30				
	Independent Study (preparation for assessment, incl. completion of assessment): 34				
Recommended Reading List	How Components Fail, Wulpi (ASM). Deformation and Fracture Mechanics of Engineering Materials, Hertzberg (Wiley)				
Module Pre-requisite	3B4 Mechanical Engineering Materials or equivalent				
Module Co-requisite	None				
Module Website					
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No				
Module Approval Date					
Approved by					
Academic Start Year					
Academic Year of Date					

² [TEP Guidelines on Workload and Assessment](#)

