

ES2C9-15 Forensic Engineering

23/24

Department

School of Engineering

Level

Undergraduate Level 2

Module leader

Stephen Hicks

Credit value

15

Module duration

12 weeks

Assessment

40% coursework, 60% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

ES2C9-15 Forensic Engineering

[Module web page](#)

Module aims

The influence of developments in materials technology and analytical techniques through the centuries provide a fascinating introduction to the discipline of structural integrity.

Students should be exposed to historical precedents through the use of case studies.

By developing understanding of qualitative analysis and forensic engineering techniques students will be able to investigate failures and learn from disasters.

Failures will also be used to introduce the need for safety and the concept of the management of risk.

The module's contents will provide a direct link to wider engineering issues such as human factors, legislation, ethics and expert witnesses.

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.

Basic concepts in the definition of satisfactory structural performance.

Key elements in structural performance.

Types of failures, ranging from reduced serviceability to total collapse.

Failure sources and their root cause allocation.

The forensic engineers tool kit.

Illustration by case studies of real disasters (e.g., Ronan Point tower, Twin Towers, Comet aircraft, Point Pleasant bridge, Grenfell Tower, Concorde, Pipers Row car park, Fukushima nuclear power station, IW-35 bridge, etc.).

Failure prevention mechanisms.

Risk and Probability of failure

Introduction to limit state design principles.

Trade magazine articles.

Human factors.

Learning outcomes

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

- Apply scientific and engineering principles to forensic engineering investigations within the context of an interdisciplinary approach to engineering.
- Explain how and why structures and complex systems have failed.
- Show that much can be learnt from disasters and that the lessons learnt can prevent similar failures from happening again.
- Demonstrate knowledge of topics related to structural reliability, risk assessment and limit state design.
- Demonstrate an awareness of what constitutes the profession of forensic engineering.
- Discuss the types of organisations and independent bodies who review and monitor matters relating to the safety of an industrial sector.

Indicative reading list

Set text book - Levy, M. and Salvadori, M., 'Why Buildings Fall Down,' W. W. Norton & Co., New York, 1992. ISBN 0393033356 (available online)

'Journal of Performance of Constructed Facilities,' American Society of Civil Engineers (ASCE)
ISSN: 0887-3828 eISSN: 1943-5509 <http://ascelibrary.org/journal/jpcf>

'Journal of Forensic Engineering,' Proceedings of the ICE. ISSN: 2043-9903 E-ISSN: 2043-9911
<http://www.icevirtuallibrary.com/content/serial/feng>

Teams will be required to read the investigation report to the case study for their trade magazine articles; these are either on Internet or with module leader (and ESO).

Research element

Students have to conduct a literature review as research for a forensic engineering case study used in the coursework assignments

Subject specific skills

1. Knowledge and understanding of the need for a high level of professional and ethical conduct in engineering and the use of technical literature, other information sources including appropriate codes of practice and industry standards
2. Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, risk assessment and risk management techniques and an ability to evaluate commercial risk
3. Knowledge of how professional engineers learn from failure and update standards, regulations and other regulatory/legal documents to minimise the risk of similar product failures happening again

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/CPD
 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. Appreciation of the global dimensions of engineering, commerce and communication
 7. Be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.
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Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Seminars	10 sessions of 1 hour (7%)
Private study	120 hours (80%)
Total	150 hours

Private study description

120 hours of guided independent learning

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D4

	Weighting	Study time
Trade Article and Individual Presentation	40%	
Group essay (Trade Magazine Article on a Forensic Engineering case study, 4000 words excluding figures, tables, references) and individual presentation of 7 mins each		
Written Examination	60%	
Centrally timetabled written examination		

- Answerbook Pink (12 page)
- Students may use a calculator
- Graph paper

Feedback on assessment

Trade Magazine Article will use both oral and written (specific form) methods for feedback from marker. Further feedback can be generated during discussion on Trade Magazine topics during the seminar programme. Model solutions to past examination papers will be available.

[Past exam papers for ES2C9](#)

Availability

Courses

This module is Core for:

- Year 2 of UESA-H216 BEng Civil Engineering
- Year 2 of UESA-H217 MEng Civil Engineering

This module is Optional for:

- Year 2 of UESA-H315 BEng Mechanical Engineering

This module is Option list A for:

- Year 2 of UESA-H113 BEng 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-H114 MEng Engineering
- Year 2 of UESA-H316 MEng Mechanical Engineering