



Unit Title	Forensic Geotechnical and Foundation Engineering
Unit Code	FE 510

Summary

Status	core
Learning Hours	40hrs including Lectures and Group Exercises
Credits Value	4
Period of Study	6 weeks

Summary of Learning Outcomes

Learning outcomes are results of learning that students will have achieved on successfully completing a course. The following reference points were used in designing the learning outcomes;

- QAA Subject Benchmark Statements to ensure: that appropriate and effective teaching, support, assessment and learning resources are provided for students; that the learning opportunities provided are monitored; and that the provider considers how to improve them; and
- The professional competencies required by the JBM.

Learning outcomes are expressed under three broad headings of achievement in both threshold and typical standards:

U: Understanding (a general awareness of the activity)

K: Knowledge (a more detailed level of understanding of the activity)

S: Skills (to be able, without supervision, to perform relevant functions)



Learning outcomes: The learner will:	Assessment criteria: The Learner can:
1. Understand Legal Process and Presenting Evidence in Forensic Engineering [U, K].	1.1 Define the duties of forensic engineer 1.2 Legal background 1.3 Law and civil litigation 1.4 Alternative dispute resolution process 1.5 Evidence reporting in range of situations 1.6 Examples
2. Understand the Various Examination and Investigation Methodologies [K, S].	2.1 Understand the investigation procedures with file management 2.2 Understand the causes of settlement of structures and cracks 2.3 Understand the bearing capacity failures in structures 2.4 Understand the ground water and moisture problems 2.5 Investigate and analysis various failures related to: site conditions; poor foundation design; materials defect; expansive soil movements; collapsible soils; earth quakes; erosion; deterioration; lateral movements of buildings due to slope failures, debris flow, landslides etc. 2.6 Case studies to understand how the cause of failure can be traced
3. Able to Recommend Repairs [K, S].	3.1 Repairs of reinforced foundation 3.2 Repairs of concrete cracks 3.3 Repairs of slope failures 3.4 Repairs of pipe piles 3.5 Case studies to understand recommendations of repairs in various failures
Additional information about the unit	
Units aim(s)	

Recommended Reading and References

1. McGraw-Hill publication, Forensic Geotechnical and Foundation Engineering 2nd edition by Robert W. Day
2. American Society of Civil Engineers' Guidelines for Forensic Engineering Practice, 2nd edition edited by Joshua B Kardon



Unit Title	Forensic Structural Engineering
Unit Code	FE 520

Summary

Status	core
Learning Hours	40hrs including Lectures and Group Exercises
Credits Value	4
Period of Study	6 weeks

Summary of Learning Outcomes

Learning outcomes are results of learning that students will have achieved on successfully completing a course. The following reference points were used in designing the learning outcomes;

- QAA Subject Benchmark Statements to ensure: that appropriate and effective teaching, support, assessment and learning resources are provided for students; that the learning opportunities provided are monitored; and that the provider considers how to improve them; and
- The professional competencies required by the JBM.

Learning outcomes are expressed under three broad headings of achievement in both threshold and typical standards:

U: Understanding (a general awareness of the activity)

K: Knowledge (a more detailed level of understanding of the activity)

S: Skills (to be able, without supervision, to perform relevant functions)



Learning outcomes: The learner will:	Assessment criteria: The Learner can:
1. Understand Codes and Standards of Forensic Engineers [U, K].	1.1 Understand design standards and British/euro codes 1.2 Construction safety standards 1.3 Forensic Engineers' duty on a structural failure 1.4 Responsibilities and liabilities of all parties (the owner, the design consultant, the contractor)
2. Understand the Investigation Process After a Failure or Structural Collapse [K, S].	2.1 Understand the steps in investigation and the documentation 2.2 Understand the causes of failures or structural collapse 2.3 Understand the consequence of gravity loads 2.4 Investigate and analysis various failures related to: earthquakes; wind; flood; blast; fire; settlements; etc. 2.5 Investigate and analysis various failures related to design errors, incorrect loads, incorrect structural analysis, calculations, etc. 2.6 Investigate and analysis nonperformance and failures related to: overload; corrosion; post-tensioning; misplaced reinforcement steel; etc. 2.7 Case studies to various failures
3. Understand the Causes of Construction and Design Defects in Various Structural Systems and Recommendation of Repairs [K, S].	3.1 Case studies to understand various defects in concrete structures 3.2 Case studies to understand various defects in steel structures 3.3 Case studies to understand various defects in masonry and masonry facades structures 3.4 Case studies to understand various defects in wood structures
4. Understand the Causes of Construction and Design Deterioration in Various Structural Systems and Recommendation of Repairs [K, S].	4.1 Case studies to understand various deterioration in concrete structures 4.2 Case studies to understand various deterioration in steel structures 4.3 Case studies to understand various deterioration in masonry and masonry facades structures 4.4 Case studies to understand various deterioration in wood structures
Additional information about the unit	



Units aim(s)	
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Recommended Reading and References

1. McGraw-Hill publication, Forensic Geotechnical and Foundation Engineering 2nd edition by Robert W. Day
2. American Society of Civil Engineers' Guidelines for Forensic Engineering Practice, 2nd edition edited by Joshua B Kardon



Unit Title	The Forensic Structural Engineer as an Expert Witness
Unit Code	FE 530

Summary

Status	core
Learning Hours	40hrs including Lectures and Group Exercises
Credits Value	4
Period of Study	6 weeks

Summary of Learning Outcomes

Learning outcomes are results of learning that students will have achieved on successfully completing a course. The following reference points were used in designing the learning outcomes.

- QAA Subject Benchmark Statements to ensure that appropriate and effective teaching, support, assessment and learning resources are provided for students; that the learning opportunities provided are monitored; and that the provider considers how to improve them; and
- The professional competencies required by the JBM.

Learning outcomes are expressed under three broad headings of achievement in both threshold and typical standards:

U: Understanding (a general awareness of the activity)

K: Knowledge (a more detailed level of understanding of the activity)

S: Skills (to be able, without supervision, to perform relevant functions)



Learning outcomes: The learner will:	Assessment criteria: The Learner can:
1. Understand Duties and Ethical Responsibilities [U, K].	1.1 Understand ethical considerations. 1.2 Understand the conceptual skills of the structural engineering expert. 1.3 Determine the key skills of a structural engineering expert. 1.4 The duties of a forensic structural engineer as an expert witness. 1.5 The stepped approach to providing an impartial and objective engineering opinion. 1.6 Assess merits and value of claims. 1.7 Disclosure process before trial. 1.8 Assist lawyers in preparing answers to the interrogatories.
2. Be Able to Prepare for Trail, Arbitration or Other Forms of Resolution [K, S].	2.1 Understand other forms of dispute resolution and the differences between them. 2.2 Understand the content of an engineering (formal) report summarising the expert's findings and opinions. 2.3 Understand the process of the trial or arbitration or other proceedings. 2.4 Be able to prepare testimony on direct examination. 2.5 Be able to prepare for arbitration or trial or other forms as an expert witness and understand the differences between the forms. 2.6 Examples of expert witness reports, testimony and examinations questions.
3. Understand the Rules of Evidence [K, S].	3.1 Understand various judicial rules of evidence in the necessity of court and laws. 3.2 Understand the factual entitlement and the importance of evidencing causation to allow entitlements. 3.3 Understand the existence of a fact and hearsay into evidence. 3.4 Understand the common exceptions to the rules of evidence. 3.5 Understand the law of evidence and both weight and admissibility in the evaluation process. 3.6 Effectively presenting evidence with photographs, plans, supporting documents, etc. 3.7 Concurrent evidence and hot tubbing.



4. Be Able to Prepare for Court Room [K, S].	4.1 Understand technical aspects of the expert's presentation. 4.2 Understand course procedures, processes and practices (what steps and when). 4.3 Communication skills with the judge. 4.4 Challenges in the court. 4.5 How to build relationship of trust in the court. 4.6 Understand general principles of expert determinations. 4.7 Converting forensic structural analysis into an expert engineering opinion.
5. Be Able to Deal Cross Examinations [K, S].	5.1 Deal with cross-examination on a case study you prepared. 5.2 Handle lawyers' techniques during the difficult cross examination and build confidence, credibility and clarity under cross examination. 5.3 Mock cross examination on a full report.
Additional information about the unit	
Units aim(s)	

Recommended Reading and References

1. Taylor and Francis Group, Forensic Engineering, 2d edition, by Kenneth L. Carper.
2. American Society of Civil Engineers' Guidelines for Forensic Engineering Practice, 2nd edition edited by Joshua B Kardon.
3. The McGraw-Hill Companies, Structural Engineering handbook, 2nd edition, by Robert T. Ratay Ph.D., P.E.