



College of Contract Management
United Kingdom

Professional Diploma in Forensic Structural Engineering



Syllabus

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1. Course Structure and Rules of Combination

1.1 Rationale

This Professional Diploma in Forensic Structural Engineering is ideal for individuals hoping to be Mechanical Engineers, Civil Engineers, Structural Engineers, Engineering Project Managers, Fire Engineers or current construction professionals who are looking to further enhance their capabilities. Forensic engineering is a vital component in the construction and engineering industry, enabling professionals to determine cause of failure and provide useful insights for future construction projects. This course has been designed to further the comprehension of learners and equip them with the skills necessary to investigate situations and deduce causes for failures.

This Professional Diploma in Forensic Structural Engineering is delivered via live online lectures. Our course lecturers have significant experience within the industry and will relate lecture content to real-life scenarios. In addition to this, lectures also include both practical examples and case studies. Through this delivery style, learners will be able to reflect on the practical challenges faced by professionals in the industry and establish an understanding of how to act in these situations in a manner that still works towards success.

1.2 Career Progression

The skills of a Forensic Structural Engineer are in consistent demand within the construction and engineering industry. Through this course learners will become adept in identifying the root cause of structural damage, and from this deduction, lead construction crews away from risk. This course has been designed to provide learners with a comprehensive understanding of incident avoidance and will equip them with the skills necessary to confidently lead projects towards success. With forensic structural engineering being such a valued skill, this profession is in high demand, and this course will grant you with vital knowledge and increased professional value.

1.3 Course Rules of Combination

The course can be completed in 5 months (approximately 18 weeks), and includes an assessment at the end of each module. Each module is worth 4 credits.

- FE510: Forensic Geotechnical and Foundation Engineering
- FE520: Forensic Structural Engineering
- FE530: The Forensic Structural Engineering as an Expert Witness

To achieve the Professional Diploma, candidates are required to complete all modules and pass their respective final assessments.

1.4 Entry Requirements

- Minimum 18 years of age **and**
- Relevant industry experience.

1.5 Module and Assessment Grades

The Assessor will award a grade for the achievement of each module (Fail, Pass, Merit or Distinction). Grades apply to overall performance in modules and assessments.

Indicative marking descriptors for differentiating between levels of achievement when marking assessments are provided below (Section 1.8).

The overall grade for a qualification is calculated using a points system. Each module grade attracts points as follows:

Fail	0 points
Pass	1 point
Merit	2 points
Distinction	3 points

1.6 Assessment

The assessment process is set by the College of Contract Management, defining the requirements learners are expected to meet in order to demonstrate that a learning outcome has been achieved. All learning outcomes must be achieved in order to gain attainment of credit for that module.

All completed assessments are marked and verified internally, and are subject to approval by our partner universities or awarding bodies.

The assessment criteria are based on 3 areas:

- 1. Task Achievement** - This is a measure of how well the candidate answers the task question(s) and identifies the important aspects of the task.
- 2. Technical Content** - This is a measure of how well the candidate identifies, describes and evaluates the technical aspects of the task.
- 3. Presentation** - This is a measure of how well the candidate presents the assessment, which includes the quality of the structure and paragraphing, the quality and relevance of visual or graphical content and the referencing used for quoted sources.

1.7 Assessment Policies

1. All submission of assessments must include:
 - a. a copy of the full brief given by the Examinations Officer or Course Administrator;
 - b. all source material must be cited in the text and a full bibliography of source material (including author, title, publisher, edition and page) listed at the end of the submission.
2. All submissions must be submitted into our system as instructed by the Examination Officer or Course Administrator.
3. All submissions under the student's name must only be the work of that student. All information sources must be acknowledged. There is the **possibility of failing the modules if the content of the assessment are deemed be plagiarised** as set out in the rules and regulations of the College.
4. All submissions should be in pdf format (unless software files are specified) and students must keep a copy of all submitted work for reference purposes. Receipt will be acknowledged by the College once the work is submitted via our online exam portal.
5. Whenever a candidate submits work after the approved deadline without an authorised extension, a maximum "Pass" grade will be awarded.
6. The Assessor will comment on the quality of the work for learning purposes.
7. Application for an extension must be requested prior to the submission deadline. Submissions must be made on the exam portal for each module extension request. A primary extension (two weeks) request can be made without the submission of any evidence or reasoning, any further extension requests will require submission of supporting documentation. All requests must be addressed to the Examination Officer or Course Administrator.

1.8 Indicative Marking Descriptors

Note: Please note that the bands below describe indicative characteristics only. An overall holistic approach is required when assessing a candidate's work and assigning a grade. Please read these grading bands in conjunction with the College of Contract Management Assignment Policy.

Grade	Task Achievement - The Relevance of the Response	Inclusion of Relevant Technical Knowledge in Content	Presentation/Coherence
Distinction			
70%+	The work demonstrates a comprehensive understanding of the task. All relevant information is included. The main issues are effectively identified and analysed. There is evaluation and some analysis of solutions to issues relevant to the task. The response shows control of content within the word count.	The work demonstrates a strong understanding of a wide range of technical issues relevant to the task. There is analysis of the advantages/disadvantages of possible choices, risks and potential outcomes.	The work is appropriately structured and the argument is developed coherently. There is a recognised form of source referencing which supports the points in the task. Paragraphing and titling are used effectively to assist the reader. The use of visual/graphical information is clear and effective in assisting the reader. The graphical information is relevant to the task and is accurate.
Merit			
60-69%	The work demonstrates a clear understanding of the main issues relevant to the task. The issues are explained effectively and potential solutions identified. There is some attempt to analyse the merits of the solutions to the task. The task is broadly achieved within the word count, if relevant to assessment.	The work demonstrates an understanding of the key technical issues of the task. There is clear description of relevant technical aspects with some attempt to evaluate the merits of these as appropriate to the task.	Demonstrates an awareness of presentation and an attempt to present the information with clarity and coherence. There is referencing of sources and use of paragraphing and titling to assist the reader. There is use of clear graphical information to support the assessment which has broad relevance to the task. There may be some limited inaccuracies/ omissions in these.
Pass			
40-59%	The work demonstrates an understanding of the task. The main points are identified and the task is achieved. There is no attempt to evaluate or analyse the solutions. There may be some inaccuracies, omissions and irrelevant content. There may be lack of control in relation to the word count.	The work demonstrates an understanding of the main technical issues which are identified. This may be limited to description with little evidence of evaluation. There may be some omissions and inaccuracies in the detail. There may be some irrelevant details.	There is an attempt to structure the information. There is evidence of paragraphing and titling which is not always appropriate. Some basic graphical information may be included which is of some assistance to the reader. There may be some omissions or inaccuracies. The work is generally coherent but there may be occasional lapses in coherence and structure.
Fail			
0-39%	The work shows a poor understanding of the task. Frequent inaccuracies. Failure to identify important aspects of the task. Much of the information is irrelevant to the task. There may be evidence of copy and paste from external sources. The response may be limited to lists of words with no attempt to explain the relevance/merits of these to the task. The assessment falls short of the word count.	The work demonstrates a lack of understanding of the technical aspects. There are omissions of important technical information. Errors are evident in the technical content. There is no attempt to explain the relevance of the technical content to the task.	Lacks structure and may be limited to lists of points which are not developed. Disorganised in structure causing difficulty for the reader to understand the points. The response is illegible or incoherent in places. No referencing of external sources. The graphical illustrations are of poor quality or absent. They may be irrelevant. There may be errors and a lack of clarity causing difficulty for the reader to understand.

1.9 Calculating Overall Qualification Grade

To calculate the overall qualification grade, the individual module grades should be added together and compared to the table below.

Candidates must pass all 3 modules of the course.

Total Points for all 3 Modules	Overall Grade
9	Distinction
8	
Merit	
7	Merit
6	
Pass	
5	Pass
4	
3	
Fail	
2 or fewer	Fail

Candidates must achieve at least a Pass in all 3 modules to be awarded the Professional Diploma.

1.10 Mandatory Modules

Module Reference	Title	LH	Credit Value
FE510	Forensic Geotechnical and Foundation Engineering	40	4
FE520	Forensic Structural Engineering	40	4
FE530	The Forensic Structural Engineer as an Expert Witness	40	4

FE510: Forensic Geotechnical and Foundation Engineering

Learning outcomes: The learner will	Assessment criteria: The learner can
1. Understand legal processes and presenting evidence in forensic engineering.	1.1 Define the duties of a forensic engineer. 1.2 Display an understanding of the legal background. 1.3 Navigate law and civil litigation. 1.4 Determine alternative dispute resolution process. 1.5 Evaluate evidence reporting in range of situations. 1.6 Study examples.
2. Comprehend the various examination and investigation methodologies.	2.1 Understand the investigation procedures with file management. 2.2 Assess the causes of settlement of structures and cracks. 2.3 Discuss the bearing capacity failures in structures. 2.4 Assess the ground water and moisture problems. 2.5 Investigate and analyse various failures related to: site conditions; poor foundation design; materials defect; expansive soil movements; collapsible soils; earthquakes; 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. Recommend repairs.	3.1 Recommend repairs of reinforced foundation. 3.2 Discuss repairs of concrete cracks. 3.3 Recommend repairs of slope failures. 3.4 Assess repairs of pipe piles. 3.5 Case studies to understand recommendations of repairs in various failures.

Recommended Reading

- Day, R. (2011) *Forensic Geotechnical and Foundation Engineering*. 2nd ed. McGraw-Hill Education.
- Kardon, J (ed). (2012) *Guidelines for Forensic Engineering Practice*. 2nd ed. American Society Civil Engineers.

FE520: Forensic Structural Engineering

Learning outcomes: The learner will	Assessment criteria: The learner can
1. Comprehend codes and standards of forensic engineers.	1.1 Understand design standards and British/Euro codes. 1.2 Comply with construction safety standards. 1.3 Identify a Forensic Engineer's duty on a structural failure. 1.4 Interpret the responsibilities and liabilities of all parties (the owner, the design consultant, the contractor).
2. Determine the investigation process after a failure or structural collapse.	2.1 Follow the steps in investigation and the documentation. 2.2 Determine 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 analyse various failures related to design errors, incorrect loads, incorrect structural analysis, calculations, etc. 2.6 Investigate and analyse non-performance 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.	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. Identify the causes of construction and design deterioration in various structural systems and recommendation of repairs.	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.

Recommended Reading

- Day, R. (2011) *Forensic Geotechnical and Foundation Engineering*. 2nd ed. McGraw-Hill Education.
- Kardon, J (ed). (2012) *Guidelines for Forensic Engineering Practice*. 2nd ed. American Society of Civil Engineers.

FE530: The Forensic Structural Engineer as an Expert Witness

Learning outcomes: The learner will	Assessment criteria: The learner can
1. Understand duties and ethical responsibilities.	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 Identify the duties of a forensic structural engineer as an expert witness. 1.5 Identify the stepped approach to providing an impartial and objective engineering opinion. 1.6 Assess merits and value of claims. 1.7 Practice disclosure process before trial. 1.8 Assist lawyers in preparing answers to the interrogatories.
2. Prepare for trial, arbitration or other forms of arbitration.	2.1 Identify other forms of dispute resolution and the differences between them. 2.2 Determine 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 Prepare testimony on direct examination. 2.5 Prepare for arbitration or trial or other forms as an expert witness and understand the differences between the forms. 2.6 Explore examples of expert witness reports, testimony and examinations questions.
3. Comprehend the rules of evidence.	3.1 Understand various judicial rules of evidence in the necessity of court and laws. 3.2 Identify the factual entitlement and the importance of evidencing causation to allow entitlements. 3.3 Comprehend the existence of a fact and hearsay into evidence. 3.4 Identify 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 Present evidence with photographs, plans, supporting documents, etc. 3.7 Prepare concurrent evidence and hot tubbing.

4. Prepare for the Court Room.	<p>4.1 Determine technical aspects of the expert's presentation.</p> <p>4.2 Manage course procedures, processes, and practices (what steps and when).</p> <p>4.3 Demonstrate clear communication skills with the judge.</p> <p>4.4 Identify challenges in the court.</p> <p>4.5 Know how to build relationship of trust in the court.</p> <p>4.6 Assess general principles of expert determinations.</p> <p>4.7 Convert forensic structural analysis into an expert engineering opinion.</p>
5. Manage cross examinations.	<p>5.1 Deal with cross-examination on a case study you prepared.</p> <p>5.2 Handle lawyers' techniques during the difficult cross examination and build confidence, credibility, and clarity under cross examination.</p> <p>5.3 Complete a mock cross examination on a full report.</p>

Recommended Reading

1. Carper, K (ed). (2000) *Forensic Engineering*. 2nd ed. Taylor & Francis.
2. Kardon, J (ed). (2012) *Guidelines for Forensic Engineering Practice*. 2nd ed. American Society of Civil Engineers.
3. Ratay, R. (2009) *Forensic Structural Engineering Handbook*. 2nd ed. McGraw Hill.