



College of Contract Management
United Kingdom

Professional Diploma in Forensic Quantum Analysis



Syllabus

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1. Course Structure and Rules of Combination

1.1 Rationale

This Professional Diploma in Forensic Quantum Analysis is designed for Claims Consultants, Engineers, Quantity Surveyors, Project Control Managers, and Contract Managers working for Civil Engineering, Oil and Gas, Petrochemical, Infrastructure, Power Plants, Nuclear, Buildings and Pipeline Projects in the Engineering, Procurement and Construction Sectors, who are progressing into a quantum analysis role. This qualification develops the learner's knowledge and skills in key quantum analysis techniques all of which are required to understand and analyse the financial consequences of delays. Furthermore it will provide understanding on how to use modules to figure out where financial losses began.

Upon successful completion of the course, learners will be able to accurately calculate financial losses and understand why this process is vital in the process of construction disputes. Through the theoretical and practical aspects of this course, learners will be able to act as an expert witness, providing valuable professional insight for potential employers.

1.2 Career Progression

This course provides the underpinning knowledge and skills to be able to advise about the potential risks of proceeding with a project, should a forensic quantum analyst be required to take short cuts or rely upon the work of others to stay within a very tight budget.

This course will be delivered by industry experts who are highly experienced in quantum analysis and have significant experience in the role. Lectures are delivered in an interactive and practical format including both practical examples and case studies. This enables the course content to reflect on the practical aspects and challenges faced by the professionals and the industry.

1.3 Course Rules of Combination

The course can be completed in 6 months (approximately 26 weeks), and includes an assessment at the end of each module. Each module is worth 8 credits.

- FQ510: Quantum Determination
- FQ520: Quantum Analysis
- FQ530: The use of Forensic Quantum Analysis by 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 old **and**
- Minimum 2 years' experience in the relevant sector.

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 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.
3. 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.
4. Whenever a candidate submits work after the approved deadline without an authorised extension, a maximum "Pass" grade will be awarded.
5. The Assessor will comment on the quality of the work for learning purposes.
6. 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 assignment.	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 assignment 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 assignment 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	
7	Merit
6	
5	Pass
4	
3	
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	Credit Value	LH
FQ510	Quantum Determination	8	80
FQ520	Quantum Analysis	8	80
FQ530	The use of Forensic Quantum Analysis by an Expert Witness	8	80

FQ510: Quantum Determination

Learning outcomes: The learner will	Assessment criteria: The learner can
<p>1. Understand the basic implications of forensic quantum in construction claims.</p>	<p>1.1 Identify the role of the forensic quantum analyst and skills required.</p> <p>1.2 Determine the forensic quantum analyst's approach to evaluation.</p> <p>1.3 Assess contractual entitlement for the contractor to claims additional payment</p> <ul style="list-style-type: none"> • Contract forms. • Variation claims. • Delay claims (loss and expense). • Suspension and termination. <p>1.4 Identify contractual entitlement for the Employer to claims additional payment</p> <ul style="list-style-type: none"> • Contract forms. • Delay claims by employer (liquidated and damages). <p>1.5 Understand evaluation process.</p> <p>1.6 Perform the basic test "remoteness of damages".</p> <p>1.7 Assess head of claims</p> <ul style="list-style-type: none"> • New or changed conditions or circumstances • Prolongation costs due to delay.. • Cost of disruption or loss of productivity. • Finance charges and interest. <p>1.8 Prepare overheads and profit</p> <ul style="list-style-type: none"> • Site overheads (P&G's). • Head office overheads and understanding use of formulas. • Profits. <p>1.9 Determine global claims</p> <ul style="list-style-type: none"> • Total cost method of claim. <p>1.10 Identify quantum meruit.</p>
<p>2. Be able to evaluate financial information related to a given project recorded in the contractor's final statement.</p>	<p>2.1 Understand how to use impartial criteria to assess the report.</p> <p>2.2 Identify accounting standards</p> <ul style="list-style-type: none"> • International Financial Reporting Standards (IFRS). • US Generally Admitted Accounting Principles (US GAAP). <p>2.3 Provide source of financial information for evaluation.</p> <p>2.4 Prepare tracing the cost of a specific event in the accounting records (the bottom-up approach).</p> <p>2.5 Use the project financial estimate at completion to identify the existence of a cost overrun at project level (the top-down approach).</p>

<p>3. Be able to determine the damages in monetary units based of the findings of the delay expert.</p>	<p>3.1 Determine general principles</p> <ul style="list-style-type: none"> • Claiming damages for breach of contract or negligence. • Recoverable losses. <p>3.2 Prepare award of financial damages</p> <ul style="list-style-type: none"> • The costs incurred by the contractor that it would not have incurred in the absence of the damaging event. • The loss of profit resulting from the damaging event. • A loss of profit if the damage is related to supplementary work. • A loss of opportunity to make a profit. <p>3.3 Understand entitlement by reference to the contract and common law.</p>
<p>4. Understand the implications and effect of quantum in construction dispute.</p>	<p>4.1 Navigate key cases the deal with head of losses</p> <ul style="list-style-type: none"> • Defects claims. • Loss of profit. • Overheads and preliminaries. • Wasted management costs. • Other examples.
<p>5. Case Law analysis.</p>	<p>5.1 Great Eastern Hotel Co Ltd v John Laing Construction Ltd & Anor 2005.</p> <p>5.2 Fujitsu v IBM 2014 and Polypearl Limited v EON Energy Solutions Limited 2014.</p> <p>5.3 Walter Lily v Mackay 2012 and Alfred McAlpine Homes North v Property and Land Contractors 1995.</p> <p>5.4 Hadley v Baxendale 1854.</p> <p>5.5 Pegler Ltd and Wang UK 2000 and GB Gas and Accenture 2010.</p>

Recommended Reading

1. Horne, R. and Mullen, J. (2013) *The Expert Witness in Construction*. Wiley-Blackwell
2. Davison, P. and Mullen, J. (2019) *Evaluating Contract Claims*. Wiley-Blackwell
3. Thomas, R. (2013) *Construction Contract Claims*. Palgrave Macmillam
4. Cushman, R. F., Carter, J. D., Gorman, P. J. and Coppi, D. F. (2000). *Proving and Pricing Construction Claims*. Wolters Kluwer Law & Business.

FQ520: Quantum Analysis

Learning outcomes: The learner will	Assessment criteria: The learner can
<p>1. Understand the methodologies of quantum/damages analysis of direct, indirect, 'other' costs.</p>	<p>1.1 Provide technical analysis to isolate changes in scope, timing, sequencing, work methods, site conditions, specifications, labour productivity, etc. to which costs are applied. The importance of demonstrating causation and linkage to the costs incurred.</p> <p>1.2 Determine cost variance analysis that compares the original estimate for the work with the actual cost incurred, and the cost variance is correlated to causes of the cost growth. With reference and understanding to the use of indices and models such as the measured mile as a benchmark for productivity and navigating the issue of errors in planned outputs.</p> <p>1.3 Record a combination of both methods.</p>
<p>2. Be able to evaluate financial information related to a given project recorded in the contractor's final statement.</p>	<p>2.1 Provide an overview of quantum calculations of Extension of Time claims.</p> <p>2.2 List man-hours, quantity, and cost variance analysis</p> <ul style="list-style-type: none"> • Contractor's responsibility for bid error and performance problems. • Owner's responsibility for compensable problems. <p>2.3 Evaluate of the reasonableness of the contractor's bid estimate.</p> <p>2.4 Determine costs of changes in scope.</p> <p>2.5 Assess loss of productivity costs.</p> <p>2.6 Report on delay/Prolongation costs.</p> <p>2.7 Calculate disruption costs.</p> <p>2.8 Manage costs associated with contractor performance problems/rework.</p> <p>2.9 Provide calculation of other costs.</p> <p>2.10 Determine calculation of owner damages.</p> <p>2.11 Monitor costs of damages incurred by the owner under</p> <ul style="list-style-type: none"> • Contractor's defective work. • Decreased production capacity due to a defective design. • Actual delay or liquidated damages resulting from the contractor's delay.
<p>3. Be able to analyse loss of productivity caused by late engineering, RFIS, and field changes.</p>	<p>3.1 Provide measured mile analysis.</p> <p>3.2 Engage in corroboration with industry studies.</p> <p>3.3 Produce a reasonable of bid productivity .</p> <p>3.4 Manage actual productivity/earned value calculations.</p> <p>3.5 Assess timing of impacting events.</p> <p>3.6 Determine cumulative impacts.</p>

4. Case Studies

Case Study 1:

Seeking to recover for increased costs paid to design and construct a project due to the Contractor's mismanagement under circumstance of owner will be the plaintiff.

Case Study 2:

Evidencing and demonstrating losses of productivity due to change in law and/or government regulations.

Case Study 3:

With reference to Van Oord and another v Allseas UK Ltd, how to establish the events that occurred and how the individuals to a project must consider the evidential standard of the contemporaneous documents.

Case Study 4:

Consideration of the possible methods to establish causation and quantification by reference to the methods included in the Society of Construction Law protocol.

Case Study 5:

When considering the law of evidence and specifically the weight and admissibility of submissions in specific regard to the requirement to evidence submissions with reference to contemporaneous records.

Recommended Reading

1. Society of Construction Law. (2017) *Delay and Disruption Protocol*. 2nd ed. (pg. 43)
2. Clay, R. and Dennys, N., ed. (2015) *Hudson's Building and Engineering Contracts*. 13th ed. Sweet & Maxwell (chapter 6)
3. Van Oord and another v Allseas UK Ltd [2015] EWHC 3074 (TCC)
4. Obrascon Huarte SA v Her Majesty's Attorney General for Gibraltar [2014] EWHC 1028

FQ530: The use Forensic Quantum Analysis by an Expert Witness

Learning outcomes: The learner will	Assessment criteria: The learner can
1. Explore the determination of forensic quantum analysis by the Expert Witness in construction claims.	1.1 Understand the role of the Expert Witness and the use of quantum analysis. 1.2 Understand the conceptual skills of the Quantum Expert. 1.3 Determine the key skills of a Quantum Expert Witness. 1.4 Support the forensic quantum analyst as the Expert Quantum Witness. 1.5 Understand the Expert Witness's approach to the application of forensic quantum to their opinion. 1.6 Manage the stepped approach to providing an impartial and objective quantum opinion. 1.7 Understand the contractual entitlement hurdles to overcome to entitle a claim for additional payment. 1.8 Understand the factual entitlement and the importance of evidencing causation to allow entitlement to additional payments <ul style="list-style-type: none"> • Reference to witness statement. 1.9 Understand the law of evidence and both weight and admissibility in the evaluation process. 1.10 Recognise and identify the appropriate methods of valuation.
2. Evaluate forensic quantum analysis.	2.1 Identify a claimant's cause of action. 2.2 Understand the casual requirements. 2.3 Understand how to how within the requirements of remoteness. 2.4 Identify the most appropriate measure of loss. 2.5 Balance compensation with consequences. 2.6 Understand the requirement of comparisons of equal and equivalent standing. 2.7 Demonstrate an understanding of tender allowances and price considerations. 2.8 Interpret voluntary incurred costs and extracting them from damages claims. 2.9 Ensure that duplication is eroded.
3. Be able to determine the damages and quantify in accord with the appropriate method and to interpret their inclusion impartially for inclusion in a report.	3.1 Interpret general principles of an expert determination <ul style="list-style-type: none"> • Understanding instructions. • Interpreting damages. • Quantifying damages. • Understanding causation. • Converting causation into quantum analysis.

4. Understand the use of quantum in construction disputes.	4.1 Balance the costs incurred with the entitlement allowed and present this in a report. 4.2 Convert quantum forensic analysis into an Expert Quantum opinion.
5. Case Law analysis.	5.1 Case Law 1 5.2 Case Law 2 5.3 Case Law 3 5.4 Case Law 4