Business and Technology International Campus

B-TIC Level 4
Extended Diploma in Quantity Surveying

B-TIC Level 5
Extended Diploma in Quantity Surveying

Version - 02

May 2025

B-TIC
PROFESSIONALISM SIMPLIFIED

CONTENTS

Changes of Specification with Previous Version

Previous Version Number	01	Current Version Number	02
Summary of changes			**Page number**
N/A			N/A

QUALIFICATION TITLE			**B-TIC LEVEL 4 AND 5 EXTENDED DIPLOMA IN QUANTITY SURVEYING**		
Qualification Number (QN)			L4 - 250520 L5 - 250521		
Level			Level 4 and Level 5		
Duration			2 Years		
Grading System			Pass / Fail		
Awarding Organization			Business and Technology International Campus LTD		
Credit Value			240		
Total Qualification Time (TQT):	2400	**Guided Learning Hours (GLH)**	1200	**Independent Learning Hours (ILH)**	1200
Entry Requirements:			Learners must be at least 17 years old. A level 3 qualification or Equivalent IELTS 5.5 or equivalent for non-native speakers. No formal requirement		
Mode of Delivery			Full Time, Part Time, Face to Face Blended Distanced or any other mode that meet the learner needs without any unlawful or unfair discrimination to any learner		
Assessment Method			Course work and appropriate methods		
Language of Instruction & Assessment			English		
Placement requirements			N/A		

About this Qualification

The qualification provides the opportunity for learners to develop in-depth skills, knowledge and understanding of the construction and development industry, which provides knowledge in cost planning, procurement processes and the management of construction projects that quantity surveyors must possess in order to effectively execute the quantity surveying scope of works in the construction industry.
The Qualification further is to educate and develop the skills in such a way that learners will explore their knowledge on the Estimation, Variation, Extension of Time, Contractual Claims and Contract Administration within a small to mega construction environment.

Qualification Objectives:

1. To provide knowledge, skills and understanding to achieve high performance.
2. To assist every learner, a successful completion of qualifications meets learner needs through a variety of delivery modes with location freedom.
3. To allow every learner a successful completion of qualification at their own pace with time freedom
4. To make opportunities to enter employment or to progress in current employment
5. To make eligible to progress to higher education qualifications in related fields
6. To provide navigation map for professional body memberships

How to meet these objectives:

1. Teaching & assessing an up-to-date skill, knowledge and understanding for higher performance.
2. Assisting a range of delivery, learning and assessment modes
3. Allowing flexible timeframes and duration to complete the qualifications.
4. Help to ground in employment or to progress in current employment as learners apply to divers roles and responsibilities in the relevant industry
5. Developing university partnerships & Developing academic skills for learners and helping appropriate unit selection to advanced entry progression to higher education in universities
6. Assisting progression to professional qualifications from professional bodies

To Develop Transferable Skills

Transferable skills (employability skills) are core to improving the career prospects and personal professional development of learners.

B-TIC qualifications intend to develop the following skills:

Problem-solving skills

- Critical thinking
- Creative skill to solve routine & non-routine problems
- Digital technology skills and

Independent skills

- Self-awareness and self-management
- Adaptability and resilience
- Reflection, planning and
- Prioritising.

Interpersonal skills

- Leadership skills
- Communication skills & Presentation Skills
- Team-ability skills
- Negotiating skills

Commercial skills

- Awareness of the relevant industry sector
- Understanding customer needs
- Finance & Budgets
- Management Skills

Qualification Framework

B-TIC commits all the necessary actions to design its qualification in accordance with the Framework for Higher Education Qualifications (FHEQ) in England, Wales and Northern Ireland, the Regulated Qualifications Framework (RQF), the Quality Assurance Agency (QAA) Subject Sector Benchmarks and the European Qualification Framework. Further, B-TIC sought to design the qualification in accordance with the relevant professional body's requirements.

Equivalences

B-TIC Level 4 & 5 diplomas have been designed equivalent to Level 4 & 5 of the Regulated Qualifications Framework (RQF), which is at the same level as the diploma.

Collaboration in Qualification Design

Learners completing B-TIC qualifications may enter employment or progress to higher education. Thus, our qualifications are designed in collaboration with employers, universities, higher education institutes, professionals, professional bodies, businesses and educational institutions, learners and centres to ensure that qualifications meet the needs and expectations of stakeholders.

Progression

B-TIC develops articulation arrangements with universities locally and internationally that provide advanced entry for B-TIC learners from Level 3 to Level 8. However, university admission criteria may change from time to time and remain at their discretion.

On successful completion of the B-TIC qualifications, learners may:

- Progress to University with advanced entry
- Find an employment
- Continue current employment with progressive competencies
- Commit to Continuing Professional Development (CPD) and
- Start a business

Prior Learning Assessment and Recognition (PLAR)

PLAR is where learners can meet entry criteria to entire a course or unit assessment requirements through Skill, knowledge and understanding which they already possess.

PLAR can be referred by different institution as follows:

- Accreditation of Prior Learning (APL)
- Accreditation of Prior Experiential Learning (APEL)
- Accreditation of Prior Achievement (APA)
- Accreditation of Prior Learning and Achievement (APLA)

B-TIC has developed a PLAR policy that allows learners to skip formal learning which learners already know with appropriate demonstration as per the B-TIC PLAR Policy.

Equality and Diversity

B-TIC provide equal opportunity for every learner without any disadvantage in terms of age, disability, gender, marital status, civil partnership, pregnancy, maternity, race, colour, nationality, ethnicity, national origins, religion, sexual orientation or any other grounds in accordance with the B-TIC Equality and Diversity Policy.

Where a feature of a specific qualification disadvantage group of learners we provide explicit clarification In this regard in the qualification specification.

Qualification Structure

The B-TIC Level 4 & 5 Extended Diploma in Quantity Surveying consists of 6 mandatory units for each level.

Unit Number	Compulsory Units	Credit	TQT	GLH	ILH
4COM1	Academic Writing and Computer Application	20	200	100	100
4ENGG2	Construction Technology And Sustainability	20	200	100	100
4QS3	Quantity Surveying Practice	20	200	100	100
4ENGG4	Science and Materials for Construction	20	200	100	100
4ENGG5	Measurement Estimation and Tendering	20	200	100	100
4ENGG6	Mathematics for QS	20	200	100	100
Compulsory Units					
5ENGG1	Site Surveying and Application	20	200	100	100
5QS2	Quantity surveying practice for complex construction	20	200	100	100
5COM3	Industry Investigation and Employment	20	200	100	100
5ENGG4	Contract and Management	20	200	100	100
5QS5	MEP Services	20	200	100	100
5COM6	Research Project	20	200	100	100

Total Qualification Time (TQT)

Total Qualification Time (TQT) is the total count of hours a learner would commit to complete on all varieties of activities demonstrating learning outcome achievements of a specific whole qualification.

TQT consists of "Guided Learning Hours" (GLH) activities and all the other forms of "Independent Learning Hours" (ILH) activities.

Guided Learning Hours (GLH)

Guided Learning Hours (GLH) are the estimated time duration that the leaner is guided to learn in facilitation of Lecturers, Supervisors, Tutors, Trainers and facilitated workshops (hereafter called "FACILITATORS") etc. for learners enabling to complete module learning outcomes at the appropriate standard.

GLH counts real time activities completed by the learner under direct instruction, supervision and / or immediate guidance) via Physical or Virtual Attendance such as,

- Supervised induction sessions
- Class room lecturers
- Class room discussions
- Assignments Reviews
- Personal meetings
- Learner feedback with a teacher in real time
- Supervised independent learning
- Supervised Literature Review
- Classroom-based learning supervised by a teacher
- Work-based learning supervised by a teacher
- Question and answer sessions
- Presentation and Feedback
- Live webinar or telephone tutorial with a teacher in real time
- E-learning supervised by a teacher in real time
- E-mail conversations
- Formative assessment and feed back
- Summative assessment and feed back
- Professional Discussions
- Interview
- Reviewing cases with lecturers
- Building a poster with facilitator
- Invigilated examinations or assessments.

All other forms of learning activities under immediate guidance, Instruction, observation or Supervision of a facilitator may be counted into Guided Learning Hours (GLH).

Independent Learning Hours (ILH)

"Independent Learning Hours" (ILH) are hours of learning activities that learners undertake without direct instruction, supervision or immediate guidance.

The verity of independent learning activities in absence of direct instruction, supervision or Immediate Guidance of facilitator may happen depending on the qualifications and level of qualification, such as

- Independent preparation for classes
- Independent reading
- Independent research

- Independent work on projects
- Independent compilation of a portfolio of work experience
- Independent e-learning
- Independent e-assessment
- Independent coursework
- Independent watching a pre-recorded podcast or webinar
- Independent work-based learning
- Independent discussion
- Independent voluntary work

Any other form of learning, education or training, in the absence of direct instruction, supervision or immediate guidance of a facilitator, may be counted as Independent Learning Hours (ILH).

Credit

The credit value specifies the awarded number of credits to a learner who has covered and assessed the learning outcomes of a unit at a specific level standard of a qualification.

The awarded credits are recorded in a credit transcript that can lead to a qualification that supports your entry to the next progress of higher education.

Each credit represents 10 hours of learning time, which is equivalent to 10 hours of “TOTAL QUALIFICATION TIME”.

The credit value of the unit is constant in all contexts regardless of result (Pass, Merit or Distinction), the assessment method or the mode of delivery.

Learners will only be awarded credits for the successful completion of the whole unit.

Specific requirement of individual learners and the differing delivery styles may cause variation in the actual time to complete a qualification thus, Values for Total Qualification Time, Guided Learning Hours, and Credit are estimates

Unit Specification Level 04

Academic Writing and Computer Applications

Unit Title	Academic Writing and Computer Applications
Unit Code	4COM1
Unit Level	Level 4
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand, develop skill sets and apply academic writing skills for academic assessments of high quality.

Unit Objectives

- To study academic writing skills for academic purposes.
- To use an appropriate range of physical and electronic academic sources.
- To learn to use the work of others for academic purposes
- To use different referencing styles
- To develop methodical approach to write academic reports and presenting to professional audience
- To develop presentation documents and to Oral present before professional audience
- To learn computer application skills & Office processing packages for academic writing

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Be able to approach academic question to answer	1.1 Answer the question with reliable and valid academic argument.	Command word; Topic word; Scope word; Answer the question; Develop the position; Evidence based reference; verifiable reference; Impersonal reference; Objective; Qualified; Precise reference (reliable and exact)
	1.2 Critically review Literature	Critical Thinking Model; Critical thinking; critical reading; Critical writing describe (What, When, Where, Who); analyze (How, Why, If so); evaluate (so what, is next); Bookmarking, note-taking, and synthesising.
	1.3 Follow writing structure	TDR structure; IBC structure; five-paragraph essay; report writing; abstract; executive summary; presentation structure; proposal structure.
LO 2 Be able to Search Academic sources for academic writing	2.1 Use different types of academic Sources and evidence	Books; journals; newspapers; YouTube; social media; Wikipedia platforms; television news; theses; conference papers; reports; lecturer notes; statistics; interviews; blogs; ads; maps; diagrams; observations; websites. Government data.
	2.2 Search Academic sources	Search engines: Google, Search GPT, Google scholar; online libraries: Questia, Open Library; Learning management systems; index journals; Kindle; Title of the source; title of the journal; author's Name;
	2.3 Evaluate different Sources of information	Published in a scientific or academic journal; published book: currency; age of source; another academic expert or specialist; written in professional or academic language; provide references; Relevancy:
LO 3 Be able to construct a reliable and valid academic answer.	3.1 Understand the common types of plagiarism	Acknowledgment; risk avoidance; plagiarism ethics; justification Clone; hijack; inaccurate referencing; patchwork; Cutting and pasting from other documents; Quoting without quotation marks or references; Paraphrasing without referencing; Summarising without referencing; Using an image, source and/or diagram without.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 3 Be able to construct a reliable and valid academic answer.	3.2 Use academic sources to write academic answers	Academic language; Paragraphs and argument flows; Writing to word counts; Paraphrasing; Summarising; Direct quotes Referencing academic works; Harvard style; Oxford style; OSCOLA; Vancouver style; American Psychological Association style; EndNote; footnote in-text citation; single author citation; multiple author citation; Author as organisation; Signpost" words and" phrases Introductory Phrases: introduce a sequence of points. Cross-referencing; adding ideas; exemplifying; focusing on a specific point; generalisation; concession; similarity; comparison; contrast; alternative point; stating the obvious; rephrasing; and introducing a reason, result, proof or logical conclusion. Building on the last section, conclusion.
	3.3 Use sources to present academic answers	Presentation PPT; visual image; posture; body language; referencing Declamation; audience analysis; paralanguage; gesture; movement; eye contact; vocal variety; listening; poise.
LO 4 Be able to use computer applications in academic writing	4.1 Apply word processing applications	Word Processing
	4.2 Apply presentation applications	PowerPoint Processing
	4.3 Apply Statistical computer applications	Spreadsheet; Excel Processing SPSS; Minitab

Essential Reading and Resource List:

Text books:

Craswell, G., and Poore, M. (2012) *Writing for academic success.* 2nd ed. New York: SAGE Publications
Gaskin, S., Vargas, A., Geoghan, D., and Graviett, A. (2020) *GO! All in one: Computer concepts and applications.* 4th ed. Harlow: Pearson.
Nordell, R. (2022) Microsoft Office 365: In practice. McGraw-Hill Education.
Murray, R. (2019) Writing for academic journals. 4th ed. Open University Press.
Poatsy, M. A., and Grauer, R. T. (2021) Exploring Microsoft Office 365: Excel, Word, PowerPoint, and Access in depth. Harlow: Pearson.
Rainer, R. K., & Prince, B. (2023) Introduction to information systems: Enabling and transforming business. 10th ed. New Jersey: Wiley.
Swales, J. M., & Feak, C. B. (2012) *Academic writing for graduate students: Essential tasks and skills.* 3rd ed. University of Michigan Press.

Journals & Newspapers:

Journal of Second Language Writing
Journal of English for Academic Purposes
Across the Disciplines
Applied Computer Systems
IEEE Computer Society Digital Library
Computers and Mathematics with Applications

Websites:

https://owl.purdue.edu
http://www.phrasebank.manchester.ac.uk

Construction Technology And Sustainability

Unit Title	Construction Technology And Sustainability
Unit Code	4ENGG2
Unit Level	Level 4
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand, develop skill sets and apply to practice quantity surveying for construction.

Unit Objectives

- To understand terminologies of construction technologies
- To understand innovative technologies in construction
- To understand civil engineering technologies used in construction,
- To understand components of Sustainable Construction Technology

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Be able to explain different terminologies applied in construction technology	1.1 Understand construction related terminologies	Building Construction; Residential Buildings, Houses, Apartments, Condominiums,and Townhomes Commercial Buildings: Offices, shopping malls, hotels, and restaurants. Institutional Buildings: Schools, hospitals, churches, government buildings, and universities. Low, medium and high-rise buildings; domestic buildings Infrastructure / Heavy Civil Construction: Highways and Roads; Bridges and Tunnels; Railways; Airports; Ports and Harbors; Dams and Reservoirs Industrial Construction: - Power Plants (nuclear, thermal, hydro); Factories and Manufacturing Plants; Oil & Gas Facilities; Chemical Processing Plants; Water Treatment Plants; Renovation & Restoration Projects Renovation: Modernising or upgrading existing buildings. Restoration: Preserving historical or old buildings to their original condition. Remodelling:Changing the structure or design of existing spaces.
	1.2 Understand construction technology related terminology	General Construction Terms: Blueprint; Foundation; Footing; Grade; Framing; Load-bearing wall Construction Tools & Equipment: Excavator; Backhoe; Crane; Scaffold; Jackhammer Materials & Components: Aggregate; Rebar; Drywall; Sheathing; Insulation Construction Methods and 3D Printing (in construction); Prefabrication; Lean Construction; Green Building. PPE (Personal Protective Equipment) Load bearing and load bearing; structural stability; movement and thermal expansion; durability; weather and moisture resistance; aesthetics; fire resistance; sound insulation; resistance to heat loss and thermal transmission; dimensional co-ordination and standardisation; sustainability and scarcity of availability; on-site and off-site construction; legal requirements; buildability; health and safety.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	1.3 Construction information related terminology	General Construction Terms: Blueprints; Specifications (Specs); Site Plan; Grade; Footprint. Structural & Material Terms: Foundation; Framing; Rebar; CMU (Concrete Masonry Unit); Drywall. Project Management Terms: RFI (Request for Information); Submittals; Change Order; Punch List; Lead Time. Construction Roles: General Contractor (GC); Subcontractor; Architect; Civil Engineer Legal & Documentation Terms: Permit; Lien; Schedule of Values (SOV); As-Built Drawings, specifications, schedules, CAD, Building Information Modelling (BIM). Sustainability: Supply chain; Life cycle; Cradle-to-grave; Cradle-to-cradle; Circular economies.
LO 2 Be able to Describe different techniques used to construction	2.1 Describe different techniques used to construct range of substructures	Site Reconnaissance; Direct Soil Investigation techniques; Substructure: basements, retaining walls, foundations, tunnels, culverts, or other supporting elements below or near ground level; Shallow and deep foundations, strip and deep strip foundations, pad foundations, raft foundations, and piled foundations (replacement and displacement piles). Different techniques are used depending on the soil type, load requirements, water table, and intended function. Shallow Foundation Techniques: Spread Footings; Raft or Mat Foundations; Deep Foundation Techniques: Pile Foundations; Driven Piles; Bored Piles; Screw Piles; Caissons (Drilled Shafts) Retaining Structure Techniques: Gravity Walls; Cantilever Walls; Sheet Piling; Waterproofing & Groundwater Control: Tank Waterproofing; Sump Pumps; Drainage Mats; Cutoff Walls or Slurry Walls Tunnel and Culvert Construction: Cut and Cover Method; Bored Tunneling; Box Jacking; Substructure Framing Techniques: Reinforced Concrete Frame; Precast Concrete Panels; Steel Framing with Concrete Infill Ground Improvement Techniques: Soil Stabilization (lime, cement); Compaction (dynamic or vibro); Grouting; Geosynthetics (geotextiles, geogrids

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	2.2 Describe different techniques used to construct range of superstructures.	Superstructures: complex structures; bridges, skyscrapers, stadiums, offshore platforms Traditional construction, framed construction: steel, composite concrete and steel, timber. Walls, roofs, structural frames, claddings, finishes, and services. Walls: External walls: traditional cavity, timber frame, and lightweight steel. Cladding: panel systems, infill systems, composite panel systems, internal partition walls. Roofs: pitched and flat roof systems, roof coverings. Floors: Ground floors, intermediate floors, floor finishes. Staircases: timber, concrete, and metal staircases; means of escape. Finishes: Ceiling, wall and floor finishes. Techniques: Steel Frame Construction; Reinforced Concrete Construction; Precast and Modular Construction. Suspension and Cable-Stayed Construction; Truss Systems; Tuned Mass Damping (TMD) Systems; Floating and Offshore Techniques; Advanced Foundation Techniques; Parametric and Digital Fabrication.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	2.3 Describe function and design of technique selection criteria	Function of technique selection criteria: Ensuring feasibility; Optimising resource use; Reducing risk; Improving quality and safety; Meeting client expectations and regulatory requirements. Design of Technique Selection Criteria: Technical Criteria; Suitability to Site Conditions; Soil Type; Topography, Access, and Climate; Compatibility with Design Specifications; Structural Load, Materials, and Architectural Features; Technology Availability; Local Availability of Equipment and Skilled Labour. Economic Criteria: Initial Cost; Equipment, labor, and material costs; Life Cycle Cost; Long-term maintenance, durability, and energy efficiency; Cost-Benefit Analysis. Time-Related Criteria: Project Duration, Impact on Schedule, Flexibility to Work in Parallel or Adapt to Delays. Environmental and Sustainability Criteria; Resource Efficiency; Environmental Impact; Emissions, noise, and site disruption; Compliance with Environmental Regulations. Risk and Safety Criteria; Occupational Safety Reliability Under Adverse Conditions; Weather and Natural Hazards; Regulatory Compliance; Adhering to Construction Codes and Standards. Social and Legal Criteria; Community Impact; Noise, Traffic Disruption, Aesthetics. Soil type on foundation design, including water and chemical content, potential loads, position of trees and the impact on foundations.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 3 Be able to Identify different types of civil engineering technologies used in support of construction	3.1 Describe techniques used for remediating the construction site prior to construction	Site Assessment and Investigation: Environmental Site Assessment (ESA); Historical review, site inspection, and interviews to identify potential contamination; Soil, groundwater, and air sampling. Soil Remediation Techniques: Contamination with hydrocarbons and heavy metals; Excavation and Off-site Disposal; Soil Washing; Bioremediation; Thermal Desorption; Stabilisation/Solidification. Groundwater Remediation: Pump and Treat; Air Sparging In-situ Chemical Oxidation (ISCO); Containment and Isolation: Capping; Slurry Walls or Sheet Piles; Monitored Natural Attenuation (MNA) Asbestos and Hazardous Material Removal: Asbestos Abatement, Lead Paint Removal, PCBs, Mercury, and Other Hazards. Site Regrading and Drainage Improvements: Regrading; Stormwater Management Systems;
	3.2 Describe the types of substructures works carried out by civil engineers	Site Preparation and Ground Investigation: Site Clearing, Soil Investigation, Levelling and Grading. Excavation and Earthworks: Shoring and Dewatering; Backfilling; Foundations: Shallow Foundations; Spread Footings; Raft (Mat) Foundations; Deep Foundations; Pile Foundations; Caissons (Drilled Shafts). Retaining Structures: Retaining Walls; Sheet Piling; Basement Construction: Basement Walls and Slabs: Waterproofing; Drainage Systems. Utility and Service Installations; Underground Pipes and Ducts; Manholes and Inspection Chambers.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	3.3 Describe the types of superstructure works carried out by civil engineers	Framing and Structural Works; Beams and Columns; Slabs and Floors; Load-bearing walls; Masonry Works; Brick or block laying; Reinforced masonry; Roofing Works; Roof Coverings Concrete Works (Above Ground); Staircases; Finishing Works (Structural); Plastering and rendering; Floor Screeding; Installation of lintels and sills Bridge Superstructure; Deck slab or roadway; Girders and trusses; Parapets and handrails; Façade and Cladding Works; Installation of external finishes. Installation of Embedded Items: Anchors, sleeves, conduits;
LO 4 Be able to understand components of Sustainable Construction Technology	4.1 identify various types of Green Building Materials	Recycled materials (e.g., recycled steel, glass, plastic) Renewable resources (e.g., bamboo, cork, straw bale) Low-VOC (Volatile Organic Compounds) paints and finishes Insulating concrete forms (ICFs) and cross-laminated timber (CLT)
	4.2 Describe technologies relevant to Energy-Efficient Systems	Smart HVAC systems with IoT integration; LED lighting and daylight harvesting; Photovoltaic (solar) panels; Energy-efficient windows and insulation; Building Energy Management Systems (BEMS); Photovoltaic (PV) Solar Panels; Smart HVAC Systems; Advanced Insulation Materials; Smart Lighting Systems High-Performance Glazing and Windows; solar heat gain coefficient (SHGC); Passive Solar Design Techniques; Energy Recovery Ventilation (ERV) Systems; Prefabricated Energy-Efficient Panels; SIPs (Structural Insulated Panels); Digital Twin Technology;

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	4.3 Explain various Waste Reduction Techniques	On-site material sorting and recycling; construction waste management plans; deconstruction. Design Phase Strategies; Design for Waste Minimization; Accurate Estimations; Material Management; Smart Procurement; Storage and Handling; Reuse and Recycling; Reuse On-Site; Partner with Recyclers; Prefabrication and Modular Construction; Construction Site Practices; Lean Construction; Just-in-Time Delivery; Worker Training and Engagement; Monitoring and Auditing; Regulatory and Green Certifications.

Essential Reading and Resource List:

Textbooks:

Bryan, T. (2010) *Construction Technology: Analysis and Choice*. 2nd ed. Chichester, Sussex: Wiley-Blackwell.
Chudley, R., Greeno, R., and Hurst, M. (2020) *Building construction handbook*. 12th ed. London: Routledge
Barry, R., & Hall, J. (2013). *Barry's introduction to construction of buildings.* 2nd ed. Oxford: Wiley-Blackwell
Emmitt, S. & Gorse, C. (2018). Barry's advanced construction of buildings. 4th ed. Oxford: Wiley-Blackwell.
Fleming, E. (2005) *Construction Technology: An Illustrated Introduction*. Oxford: Blackwell.
Greeno, R., and Chudley, R. (2016) *Construction technology*. 5th ed. Abingdon: Routledge.

Journals & Newspapers:

Building Services Engineering Research & Technology
Construction Innovation
Construction News
International Journal of Sustainable Construction Engineering and Technology (IJSCET)
Journal of Sustainable Construction Materials and Technologies (JSCMT)

Websites:

https://www.designingbuildings.co.uk
https://www.bsria.com/uk/

Quantity Surveying Practice

Unit Title	Quantity Surveying Practice
Unit Code	4QS3
Unit Level	Level 4
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand, develop skill sets and apply to practice quantity surveying for construction.

Unit Objectives

- To understand the roles of the quantity surveyor
- To understand the activities of a quantity surveyor in the pre-construction phases of a project
- To assess the processes of quantity surveying during the construction phase of a project
- To present a case study that considers the role and activities of a quantity surveyor for a given project

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Be able to explain the roles of the quantity surveyor	1.1 Describe the different types of quantity surveyors.	Cost Planning and Estimating; Feasibility Studies; Procurement Advice; Contract Administration; Cost Control During Construction; Risk Management; Value Engineering; Final Account Preparation; Dispute Resolution; Life Cycle Costing
	1.2 Discuss the way that a quantity surveyor may support clients through contracts and cost management.	Advice and guidance provided by the quantity surveyor: Financing projects (feasibility); Procurement routes; Tendering procedures; Contract selection; Main contractor selection recommendations
	1.3 Compare the roles of the professional quantity surveyor and the main contractor's quantity surveyor.	Administrative responsibilities: Contracts; Budgeting; Cost control Professional development: Identifying own development needs; Continuing Professional Development (CPD); Supporting the development of others; Professional bodies and maintaining professional knowledge Relationship with other professionals: Design team (e.g., architects, interior designers); Consultants (e.g., engineers, project managers); Construction team (e.g., contractors, sub-contractors, suppliers)
LO 2 Be able to explain the activities of a quantity surveyor in the pre-construction phases of a project	2.1 Describe the role of the quantity surveyor in the feasibility stage of a project.	Feasibility: Strategic definition (e.g., procurement route selection, main contractor selection); Preparation and brief (e.g., financial feasibility of the proposed project); Comparison of designs Cost value engineering: Revision of client's specifications to suit budgets; Costing of design revisions; Reconciliation of value engineering within the overall budget Procurement; Procurement strategy during project phases (e.g., concept, development, technical design); Contract selection; Change control procedures Tendering activities: Preparation of documentation (e.g., Bills of quantities, cost plan, tender invitation, specifications, contracts documents); Updating information; Contract documentation (e.g., letters of intent/acceptance, selection of suitable contracts, completion of contracts for signature by parties, filing and contract administration); Contractor selection (e.g., background/experience/capacity checks, financial checks, interviews); Contractor negotiation and appointment

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	2.2 Illustrate ways in which cost control and value engineering contribute to the project budget.	Cost value engineering: Revision of client's specifications to suit budgets; Costing of design revisions; Reconciliation of value engineering within the overall budget
	2.3 Analyze the interactions between the design team and the quantity surveyor.	Cost value engineering; Procurement; Tendering activities
LO 3; Be able to assess the processes of quantity surveying during the construction phase of a project	3.1 Describe the role of the quantity surveyor during the construction phase	Financial control: Valuations of work to date; Compilation of financial/payment certificates; Predicted expenditure; Valuation of variations; Measurement against agreed rates, Risk management.
	3.2 Discuss the contract administration activities of a quantity surveyor during the construction phase	Dispute resolution; Administration of the contract in terms of conditions; Record keeping regarding claims; Site measurements and inspections; Agreement of claims; Resolution of disputes between main contractor and client parties
	3.3 Explain the relationship between financial control and valuation	Valuations: Monthly valuations; Certification; Measurement of variations; Agreement of quotations Variations to contract: Acceptance under contract terms; Pricing of variation against bill of quantities (BoQ) or rates; Day works; Offsets against contingencies Final accounts: Omissions and additions account; Adjustment of provisional sums; Adjustment of prime cost sums; Measurement of variations; Calculation of final account sum
LO 4 Be able to present a case study that considers the role and activities of a quantity surveyor for a given project.	4.1 Discuss the pre-contract administration of a given project.	Project type: Building (new or refurbishment); Civil engineering/infrastructure project Project budget: Initial client's budget; Revisions to a budget, as required Procurement strategy: Type of procurement; Advantages and benefits of your procurement selection
	4.2 Describe how a given project is financially controlled.	Cost control: Aspects of cost control on your project; Control against the contract sum; Variations and how to accommodate these in final summaries Contract administration: Communications between parties; Valuations and payments; Certification records
	4.3 Explain how a client's budget for a given project can be controlled.	Contract administration; Cost control

Essential Reading and Resource List

Textbooks:

Ashworth, A., Hogg, K. and Higgs, C. (2013) *Practice and Procedure for the Quantity Surveyor*. 13th ed. Chichester: Wiley Blackwell.
Pittard, S. and Sell, P. (2016) *BIM and Quantity Surveying*. Abingdon: Routledge.
Cartlidge, D. (2022) *Quantity surveying practice.* 3rd ed. Abingdon: Routledge.

Journals & Newspapers:

Construction Journal
International Cost Engineering Council (ICEC)
International Surveying Research Journal (ISrJ)
The Malaysian Surveyor

Websites:

https://www.designingbuildings.co.uk
https://www.rics.org/uk/upholding-professional-standards/sector-standards/construction/new-rules-of-measurement-nrm/
https://www.cibse.org
https://www.bsria.com/uk/

Science and Materials for Construction

Unit Title	Science and Materials for Construction
Unit Code	4ENGG4
Unit Level	Level 4
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand properties of construction material for structure and envelope.

Unit Objectives

- To Understand the properties of materials for construction
- To Understand the structural behavior of construction materials
- To Understand the properties of materials for construction of envelope
- To apply scientific principles to the design and use of buildings

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Be able to Understand the properties of materials for construction	1.1. Describe the properties of construction materials	Materials: metals and alloys, e.g., iron, steel, zinc, copper, brass, aluminium, lead, stainless steel; timber and timber products; clay products, e.g., bricks, tiles; cements and concretes, e.g., blocks, gypsum, moulding; plastics and other artificial materials, i.e., PVC, DPC, DPM, panel boards, and cable; coatings and finishes, e.g., paints, clear finishes, and wood treatments. Natural stones, i.e., granite marble and glazing products
	1.2 Evaluate the properties and uses of construction materials	Properties of materials: as appropriate to field of study, e.g. strength, elasticity, porosity and water absorption, thermal and moisture movement, thermal and electrical conductivity/resistivity, durability, workability, density, specific heat capacity, viscosity, safety
	1.3 Justify the specification of construction materials regarding their performance in use	Uses of materials: construction, refurbishment, maintenance, replacement, energy efficiency, environmental issues, use of renewable resources, and sustainability: eco-friendliness.
LO 2 Be able to Understand the structural behavior of construction materials	2.1 Discuss the types of loading in construction structure	Building structural components: beams, columns, slabs, and foundations. Dead loads, live loads, wind, seismic loads and environmental. Environmental Loads: Wind Load; Snow Load; Seismic Load (Earthquake Load; horizontal and vertical motion). Thermal Load: temperature changes; expansion or contraction of materials. Rain Load; drainage or blockage; Flood or Hydrostatic Load; Soil Load / Earth Pressure.
	2.2 Discuss the effects of loading on construction structure	Effects of force on the performance, durability, and safety of a structure. Stress and Strain: elastic limit, permanent deformation. Deflection, structural and aesthetic issues, and cracked ceilings or misaligned doors/windows. Fatigue: Repeated loading and unloading especially in bridges or high-traffic buildings; Cracking and Fracture; Creep; Buckling; Vibration and Dynamic Response; Settlement and Foundation Issues Material-Specific Behaviour: Steel; Concrete: Timber.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	2.3 Discuss how materials can cause structural failures	Structural materials: timber, metals, steel, and reinforced concrete. Failure in use: fracture; fatigue; creep; corrosion; chemical degradation (physical and biological) Fracture: strain energy; fracture energy; Griffith crack theory. Fatigue: cyclical loading; stress concentrations; corrosion; residual stresses; surface finish; temperature Creep: duration of loading, stress, temperature, modulus of elasticity. Corrosion of metals: dry oxidation; wet corrosion Chemical degradation: cements and concrete; degradation (sulphates, seawater, acids, alkali-silica reaction, carbonation) Physical degradation: by changes in temperature and moisture content, frost and fire; Biological degradation: fungi; insects.
LO 3 Be able to Understand the properties of materials for construction of envelope	3.1 Describe the types of materials for construction of envelope	Exterior Wall Materials: Brick; Concrete (Precast or Poured-in-Place); Stone; Wood; Cladding; Siding; Metal Panels (Aluminium, Steel, Zinc); Fibre Cement; Stucco; EIFS (Exterior Insulation and Finish Systems). Glazing; Transparent Materials; Single/Double/Triple Glazed Glass; Low-E Glass (Low Emissivity); Laminated or Tempered Glass; Polycarbonate Panels Roofing Materials: Asphalt Shingles: Metal Roofing, Clay or Concrete Tiles, Membrane Roofing (EPDM, TPO, PVC), Green Roof Systems Insulation Materials: Fibreglass, Mineral Wool (Rock Wool), Rigid Foam Boards (XPS, EPS, Polyiso), Spray Foam Insulation. Weather Barriers & Vapor Barriers; House Wraps; Bituminous Membranes; Liquid-Applied Membranes; Vapor Retarders;

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	3.2 Describe the properties of materials for construction of envelope	Thermal Properties: Thermal Conductivity, Thermal Resistance, Thermal Mass, U-Value. Moisture Resistance; Water Permeability; Vapour Permeability; Capillarity; Hydrophobic/Hygroscopic Behaviour. Air Barrier Performance; Airtightness; Wind Load Resistance; Acoustic Properties; Sound Transmission Class (STC); Noise Reduction Coefficient (NRC) Fire Performance; Fire Resistance Rating; Flame Spread Index; Smoke Development Index; Structural & Mechanical Properties; Compressive/Tensile Strength; Flexural Strength; Impact Resistance; Durability; Environmental Properties; Recyclability/Reuse; Embodied Energy; Carbon Footprint; Toxicity/Off-Gassing Aesthetic and Finishing Properties; Colour Retention; Texture/Surface Finish; Paintability or Coating Compatibility.
	3.3 Justify the specification of materials for varied construction of envelope	Refurbishment, maintenance, replacement, energy efficiency; environmental issues; use of renewable resources, sustainability: eco-friendliness, cost. Thermal Performance and Insulation, Moisture and Weather Resistance, Airtightness and Ventilation Control, Structural Requirements, Aesthetics and Cladding, Durability and Maintenance, Fire Resistance, Sustainability and Environmental Impact.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 4 Be able to apply scientific principles to the design and use of buildings	4.1 Relate scientific principles to human comfort levels	Design and use of buildings: factors affecting human comfort levels; building services; thermal performance Factors affecting human comfort: thermal comfort (air temperature, mean radiant temperature, air velocity, relative humidity); lighting comfort (natural light, artificial light, minimum levels of illumination, glare); acoustic comfort (sound transmission, sound absorption, sound insulation, reverberation); air pollution; radiation.
	4.2 Discuss the methods used to integrate building services into the overall building design	Building services: cold and hot water supply and distribution; drainage works; gas supply and distribution; electricity supply and distribution; safe and effective disposal of waste products; refrigeration and air conditioning; fluid flow (hydrostatics, fluid dynamics).
	4.3 Determine the thermal performance of buildings regarding heat gains and heat losses	Thermal performance levels: thermal properties of materials; heat losses (fabric, ventilation, hot water, external weather); heat gains (solar, casual, hot water, plant and equipment); required level of heat input; adequate levels of ventilation

Essential Reading and Resource List

Textbooks:

Buxton, P. (2022) *Metric Handbook: Planning and Design Data.* 7th ed. Abingdon: Routledge.
Casini, M. (2016) *Smart Buildings: Advanced Materials and Nanotechnology to Improve Energy Efficiency.* 1st ed. London: Woodhead Publishing.
Claisse, P. A. (2016) *Civil Engineering Materials.*1st ed. Oxford: Butterworth-Heinemann.
Lynch, G. (2018) *The science of construction materials* 2nd ed. CRC Press.
Lyons, A. (2020) *Materials for Architects and Builders.* 6th ed. Abingdon: Routledge.
Mamlouk, M. S., and Zaniewski, J. P. (2016) *Materials for civil and construction engineers.* 4th ed. Harlow: Pearson.

Journals & Newspapers:

Construction and Building Materials
Cement and Concrete Research
Journal of Materials in Civil Engineering
Journal of Sustainable Construction Materials and Technologies (JSCMT)

Websites:

https://www.ice.org.uk
https://www.ciria.org
https://www.bregroup.com

Measurement Estimation and Tendering

Unit Title	Measurement Estimation and Tendering
Unit Code	4ENGG5
Unit Level	Level 4
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand measurement, estimating and tendering for construction contracts.

Unit Objectives

- To define standard measurement techniques used for taking-off quantities in construction
- To apply taking-off techniques for Estimating in construction
- To produce estimates for construction projects
- To Understand tendering procedures and contractual arrangements

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Define standard measurement techniques used for taking-off quantities in construction	1.1 Explain standard measurement techniques used in Taking off quantities	Detailed Drawings and Specifications Work Breakdown Structure (WBS): substructure; superstructure; finishes Checklists and Coding Systems; Measurement Units: Linear (m), Area (m²), Volume (m³), Number (nr) – e.g., doors, windows; Weight (kg or tonnes); Deductions and Additions: Recognizing voids, overlaps, or excluded elements Dimensional Accuracy; Manual Take-Off; - Scale rulers; Measuring tapes; Hand calculations or spreadsheets Site Verification and Adjustments Site measurements may differ from the design due to ground conditions, design changes, or buildability issues. Quality Assurance and Cross-Checking: Peer reviews, audits, and reconciliation with previous projects help ensure accuracy. Double-checking measurements and calculations is a standard practice.
	1.2 Explain standard rules of measurement techniques in talking off quantities	Standardization; Precision; Repeatability; Clarity; New Rules of Measurement (NRM) NRM 1 – quantification of building works for the purpose of preparing cost estimates and cost plans NRM 2 – preparation of bills of quantities and quantified schedules of works NRM 3 – quantification and description of maintenance works Civil Engineering Standard Method of Measurement 4 (CESMM4) – procedure for the preparation of a Bill of Quantities International Construction Measurement Standards (ICMS) International Property Measurement Standards (IPMS) SMM7

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	1.3 Discuss techniques used for production of quantities in each stage of construction life cycle	Initiation: Rough Order of Magnitude (ROM) Estimates; Analogous Estimating Planning; Detailed Quantity Take-off; BoQ Preparation; Parametric Estimating Execution; Quantity Tracking; Earned Value Analysis; Progress Reports; Monitoring & controlling; Quantity Comparison vs. Baseline; Re-forecasting; Change Control Closure; Final Quantity Audits; As-built Quantities; Post-project Review
LO 2 be able to apply taking-off techniques for Estimating in constxruction	2.1 Identify the resources required for a construction operation.	Skilled labor; Unskilled labor; Supervisory staff; Technical staff; Project management team Material Resources; Raw materials; Prefabricated materials; Finishing materials; Equipment and Machinery; Heavy machinery; Small tools and equipment; Transport vehicles; Financial resources: capital investment, Operational budget, Contingency funds, Time Resources; Project schedule and timeline; Labor shifts and work hours; Deadlines and milestones Information and Documentation; Construction drawings and blueprints; Permits and legal documents; Safety regulations and compliance codes; Project plans and specifications;

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	2.2 Collect the data required to build up unit costs rates	Material Costs: Unit prices (per m³, kg, or unit) Waste allowance (typically 2–10%) Supplier quotes or local market rates Labor Costs; Labor categories (skilled, semi-skilled, unskilled) Daily or hourly wage rates Productivity rates (m²/day) Allowances and overheads (insurance, taxes, welfare) Plant and Equipment Costs; Hire or ownership costs per day/hour; Fuel, maintenance, and operator charges; Utilization and idle time; Transportation to and from site; Subcontractor Rates; Quoted lump sum or unit rates; Inclusions/exclusions; Terms of payment and scope of work; Productivity Norms: Standard time to complete one unit of work. Crew composition; Output per team per day/week; Overheads and Profit; Preliminaries and general items (site office, temporary works) Head office overheads; Contractor's profit margin (typically 5–20%) Project Specific Factors; Location factors (urban vs. rural); Access, terrain, logistics; Project size and complexity; Market conditions (inflation, shortages) Historical Data and Benchmarks: Past project data for similar works. Published cost data (BCIS, SPON's, CESMM, etc.) Industry norms Regulatory and Statutory Costs; Permit fees; Environmental Compliance; Health and safety provisions
	2.3 Calculate quantities and costs for construction activities	Quantification; compiling

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 3 Be able to produce estimates for construction projects	3.1 Use standard "documentation and measurement rules" for taking off	Standard reference documents; coverage rules for units of work; Standard Method of Measurement (SMM 7), New Rules of Measurement (NRM), Civil Engineering Standard Method of Measurement (CESMM3); ARM (Australian Rules of Measurement) or country-specific standards.
	3.2 Produce "Method Statements" for compiling unit costs for identified items	Activity Description; Scope of Work; Work Sequence Resources Required (Labor, Materials, Equipment); Productivity and Output; Quality Control; Health & Safety; Measurement Unit.
	3.3 Prepare a detailed estimate in line with industry standards	Project Type; Timeline; Team Composition; Resources/Tools; Location; Contingency and Overhead.
LO 4 Be able Understand tendering procedures and contractual arrangements	4.3 Explain tender Process Stages	Advertisement (if open tender); Prequalification (for selective tenders); Tender Submission; Tender Opening; Evaluation and Clarifications; Award of Contract.
	4.1 Analyse tender documents	Client: Invitation to Tender (ITT) or Request for Tender (RFT); Scope of Work / Specifications; Drawings and Plans; architectural, structural, MEP (Mechanical, Electrical, Plumbing); Bill of Quantities (BoQ) Conditions of Contract: legal terms, liabilities, insurance, penalties, Form of Tender: template
	4.2 Produce tender documents.	Bidder; Completed Form of Tender; Construction Programme / Timeline; Pricing and Cost Breakdown; Method Statement; Qualifications and Experience; Health & Safety Plan; Bid Bond or Tender Security.

Essential Reading and Resource List

Textbooks:

Brook, M. (2016). *Estimating and tendering for construction work.* 5th ed. Abingdon: Routledge.
Cartlidge, D. (2013) *Estimators Pocket Book*. Abingdon: Routledge.
Greenhalgh, B. (2013) *Introduction to Estimating*. Abingdon: Routledge.
RICS. (2021) *New rules of measurement NRM 1: Order of cost estimating and cost planning for capital building works.* 3rd ed. RICS.

Journals & Newspapers:

Construction Business Review
Journal of Financial Management of Property and Construction
Journal of Construction Engineering & Management
Journal of Surveying Engineering

Websites:

https://www.rics.org
https://www.ciob.org
https://www.rics.org/uk/products/data-products/bcis/

Mathematics for QS

Unit Title	Mathematics for QS
Unit Code	4ENGG6
Unit Level	Level 4
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit iintends forthe learners to understand the application of mathematics in quantity surveying.

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Unit Objectives

- To use analytical and computational methods to solve construction-related problems
- To investigate applications of statistical techniques to interpret, organize and present data by computer applications
- To illustrate the wide-ranging uses of calculus within different construction disciplines by solving problems of differential and integral calculus
- To use mathematical methods to solve vector analysis, arithmetic progression and dimensional analysis problems

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Be able to Use analytical and computational methods to solve construction-related problems	1.1. Solve construction problems using trigonometry techniques	Analytical methods: Trigonometry Irregular areas and volumes; Sine rule; Cosine rule; Area of triangles applications Trigonometry: Coordinate systems; Basic trigonometric ratios and their inverses; Trigonometric ratios for the four quadrants; Solution of triangles; Areas and volumes of regular solids.
	1.2 Apply the use of matrices to solve problems.	Algebra: Linear; Simultaneous and quadratic equations (graphical or algebraic solving).
	1.3 Solve construction problems using algebraic techniques.	Matrices: Multiplication; Transposition; Inversion (up to 2 × 2) Application to construction problems: Analysis and design issues; Processes and operations; Resource issues, e.g., labor, finance; Project planning; Levelling, contouring; Triangulation, traversing, cut and fill, setting out.
LO 2 Be able to investigate applications of statistical techniques to interpret, organize and present data by using appropriate computer software packages	2.1 Apply statistical methods, including the calculation of the mean and standard deviation, to produce accurate and appropriate solutions to construction engineering problems.	Statistical methods: Presentation of data (histograms, frequency graphs, cumulative frequency graphs). Central tendency and dispersion: Dispersion (standard deviation, variance, interquartile range).
	2.2 Calculate probabilities within both binomially distributed and normally distributed random variables	Distribution theory: normal distribution; Measures of dispersion (range, variance, standard deviation, quartiles, deciles and percentiles); Grouped and ungrouped data; Probability theory, binomial and normal distribution.
	2.3 Interpret the results of a statistical hypothesis test conducted from a given scenario	Applications: Presentation of data; Estimation; Prediction; Quality control.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 3 Be able to illustrate the wide-ranging uses of calculus within different construction disciplines by solving problems of differential and integral calculus	3.1 Use differential calculus techniques to solve functions which incorporate: axn, sine ax, cosine ax, loge x, eax and methods including function of a function.	Differential calculus: Basic differentiation techniques applied to algebraic, trigonometric and logarithmic functions; Products and quotients; Function of a function; Second order derivatives; The location of stationary value
	3.2 Use integral calculus techniques to determine indefinite and definite integrals of functions involving axn, sine ax, cosine ax, 1/x and eax.	Integral calculus: Indefinite and definite integration techniques applied to algebraic, trigonometric and exponential functions
	3.3 Apply the rules of integral calculus to determine solutions for complex construction related problems.	Integral calculus: Indefinite and definite integration techniques applied to algebraic, trigonometric and exponential functions Practical construction problems: Solution of problems involving maxima and minima; Growth and decay; Centroids; Moments of inertia; Areas under curves and volumes of revolution; Use in electrical theory, structural mechanics, fluid mechanics as appropriate
LO 4 Be able to Use mathematical methods to solve vector analysis, arithmetic progression and dimensional analysis problems	4.1 Apply dimensional analysis to solve problems	Arithmetic progressions; Dimensional analysis
	4.2 Generalise answers from a contextualised arithmetic progression problems.	Arithmetic progressions; Dimensional analysis
	4.3 Solve construction problems using vector analysis.	Trigonometric techniques: Vector analysis (e.g., static forces, relative motion, frameworks)

Essential Reading and Resource List

Textbooks:

Wright, J., and Bannister, A. (2018) *Mathematics for the built environment*. Swansea: Red Globe Press.
Lee, S., and Trench, W. (2019) *Basic construction mathematics.* Abingdon: Routledge.
Hoffman, D. G. (2016) *Applied mathematics for the construction trades.* 2nd ed.Boston: Cengage Learning.

Journals & Newspapers:

Civil Engineering Standard Measurement Method Adoption Using a Structural Equation Modelling Approach
IMA Journal of Management Mathematics
Journal of Mathematical Analysis and Applications
SIAM Journal on Applied Mathematics

Websites:

https://www.rics.org
https://www.rics.org/uk/products/data-products/bcis/
https://www.rics.org/uk/upholding-professional-standards/sector-standards/construction/new-rules-of-measurement-nrm/

Unit Specification Level 05

Site Surveying and Application

Unit Title	Site Surveying and Application
Unit Code	5ENGG1
Unit Level	Level 5
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand site surveying for land development and contraction.

Unit Objectives

- To study and apply range of surveying skills for construction
- To use tools for surveying
- To produce survey plans
- To apply survey data for construction

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Be able to understand surveying for construction	1.1 Explain basic principles of surveying used in construction	Basic principles of surveying: working from whole to part. Location of a Point by Measurement from Two Points of Reference; Consistency of Work; Independent Checks; Accuracy and Precision.
	1.2 Explain types of surveying used in construction	Leveling: Principles and methods of levelling (Direct Levelling, differential, fly leveling, profile levelling, Reciprocal Levelling), Backsight (BS), Foresight (FS); Height of Instrument (HI): Reduced Level (RL); Chain Surveying: - Chain or measuring tape; Ranging rods; Arrows; Pegs; Cross-staff or optical square; Reconnaissance Survey; Station Marking; Measuring; Offsetting; Compass Traversing: Prismatic Compass; Surveyor's Compass Fore Bearing (FB); Back Bearing (BB); Traverse; Included Angle: Open Traverse; Closed Traverse: Reconnaissance: Station Marking: Measurement; Record Field Data; Plot the Traverse; Adjustment:
	1.3 Follow safety procedures during fieldwork	Risk Assessment; Personal Protective Equipment (PPE); Hydration; Weather-Awareness; First Aid and Emergency Preparation; Surveying Equipment and Tool Safety: Inspect Equipment Regularly; Handle with Care; Use Proper Lifting Techniques; Site-Specific Practices; Traffic Control; Avoiding Slips, Trips, and Falls; Work in Pairs
LO 2 Be able to operate surveying tools	2.1 Theodolite Surveying	Levelling instruments and measuring tape; a compass to measure distances, angles, and elevations; parts of a theodolite and their functions. Temporary adjustments: Measurement of horizontal and vertical angles; Traversing using a theodolite; Traverse computations and balancing
	2.2 Tacheometry and Total Station	Principles of tacheometric surveying; Instruments and stadia method; Introduction to Total Station; Data collection and transfer; Field procedures and applications
	2.3 GPS and Remote Sensing in Surveying	Basics of GPS: working and types; Applications in land and site surveying; Introduction to GIS and Remote Sensing; Use in site selection and planning.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 3 Be able to produce survey plans;	3.1 Carry out basic field surveys for construction	Levelling, chain surveying, and compass traversing; Levelling exercises; Theodolite and Total Station use; Contour mapping; GPS data collection
	3.2 Interpret and produce simple survey drawings	Lab / Field Work; Transfer data for processing; Survey Computations and Data Processing; Coordinate systems and conversions; Area and volume calculations; Data recording and adjustment; Use of software (AutoCAD, Civil 3D, GIS tools)
	3.3 Interpret and produce contour maps from collected data	Setting Out: Boundary Marking: Grid Layouts: Elevation Control:
LO 4 Be able to apply survey data	4.1 Evaluate the survey data	Data evaluation for accuracy
	4.2 Apply survey data to support site layout	Understand the Survey Data: Types of Data; Topographic survey; Boundary survey; Utilities survey; Features survey; Import Survey Data into Design Tool; CAD or BIM software: AutoCAD, Civil 3D, Revit Terrain analysis; Plan the Site Layout; Use the survey data to guide building placement, access roads and parking, utility connections, and stormwater management. Validation and Annotation.
	4.3 Apply survey data to support earthworks	Planning and Design; Create Topographic Maps; Volume Calculations; Design Optimisation; Earthwork Execution; Setting Out. Machine Control Systems: Monitoring Progress, Quality Control and Compliance, Verification, Reporting

Essential Reading and Resource List

Textbooks:

Clancy, J., & Rogers, P. (2022) *Practical site surveying and measurements for construction.* Abingdon: Routledge.
Paul, R. (2014) *Construction site surveying: A field guide for civil engineers.* New Jersey: Wiley
Schofield, W., and Breach, M. (2019) *Engineering surveying.* 7th ed. Abingdon: Routledge.
Uren, J., and Price, B. (2018) *Surveying for engineers.* 5th ed. Macmillan Education UK.

Journals & Newspapers:

Construction Week
Engineering News-Record (ENR)
International Journal of Geospatial and Environmental Research
Journal of Surveying Engineering
Journal of Geospatial Engineering

Websites:

https://www.rics.org
https://www.ice.org.uk
https://geospatial.trimble.com
https://www.tsa-uk.org.uk
https://www.esri.com

Quantity surveying practice for complex construction

Unit Title	Quantity surveying practice for complex construction
Unit Code	5QS2
Unit Level	Level 5
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand, develop skill sets and apply to practice quantity surveying for complex construction.

Unit Objectives

- To study and understand the functions of QS during pre-contraction and post construction phases
- To develop skill to work with different parties
- To develop skills for contracting for construction project
- To provide research report for range of audience

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Analyze the functions of a quantity surveyor on complex construction	1.1 Analyze the pre-construction functions of a professional quantity surveyor and a contractor's quantity surveyor	Clearly identify and explain a range of core and specialist functions of a quantity surveyor within large, complex projects. Includes accurate use of technical terminology and demonstrates understanding of both pre-contract and post-contract responsibilities. Professional Quantity Surveyor (PQS) Pre-Construction Functions:- Cost Planning and Estimating; Feasibility Studies; Procurement Advice; Value Engineering; Tender Documentation and Management; Risk Management; Costing the client's project into a budget Preparation of any nominated or named contractors Obtaining quotations for nominated works Preparation of bills of quantity (BOQ) Preparation of tender documentation Specifications Select tender list compiled Sending out project enquiries Receiving tenders Adjudicating tenders Awarding project Contractor's Quantity Surveyor (CQS) Pre-Construction Functions; Tendering and Bid Preparation; Buildability and Programming Input; Procurement Planning; Risk and Opportunity Analysis; Value Engineering and Innovation; Cash Flow Forecasting; Read and digest tender documentation. Analysis of project into packages; Obtaining quotations for packages of work; Materials and plant enquiries Assembly of tender documentation; Specifications; Costing of preliminary items; Tender adjudication meeting; Tender submission; Tender Evaluation and Negotiation

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	1.2 Analyze the construction face functions of a professional quantity surveyor and a contractor's quantity surveyor	Professional Quantity Surveyor (PQS): Interim Valuations & Payment Recommendations; Cost Monitoring & Control; Valuation of Variations; Change Control; Contract Administration Support; Financial Reporting; Final Account Preparation Issue and sign contracts; Pre-start meeting; Check valuations; Issue certificates; cost and agreement on variations; Running final account summary; Agree final account; Release retention Contractor's Quantity Surveyor (CQS): Valuation of Work in Progress; Cost Management & Control; Procurement & Subcontract Management; Measurement & Valuation; Variation Claims; Claims Management; Final Account Negotiation Obtain signature on contracts; Analysis of lead-in times; Ordering and procurement of subcontractor's packages; Requisition of plant and materials via buyer; Monthly valuations; Pricing variations; Assembly of claims; Submission of final account
	1.3 Analyze the post-construction functions of a professional quantity surveyor and a contractor's quantity surveyor	Professional Quantity Surveyor (PQS): Final Account Preparation and Agreement; Cost Report Finalization; Post-Completion Audit; Contractual Advice; Feedback and Lessons Learnt; Archiving and Documentation Contractor's Quantity Surveyor (CQS): Final Account Submission; Subcontractor Final Accounts; Cash Flow Review; Claims and Dispute Support; Project Close-Out Documentation; Internal Reporting and Review; assess cost implications of variations; Close-Out; Agreement of Final Account; Post-Project Review; Legal & Dispute Resolution Support.
LO 2 Explain the quantity surveyor's interactions with construction teams	2.1 Describe Roles and Responsibilities of project teams	The explanation clearly outlines the specific roles and responsibilities of the quantity surveyor within the construction team (e.g., cost management, contract administration, procurement advice).
	2.2 Identify of Key Interactions with Project Stakeholders	The learner identifies and explains the quantity surveyor's interactions with key team members such as architects, engineers, contractors, and clients, including examples of collaboration and communication
	2.3 Understand the Impact on Project Success	The explanation demonstrates an understanding of how the quantity surveyor's input influences project outcomes, such as cost efficiency, risk management, and adherence to timelines and budgets.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 3 Prepare a contract for a complex construction	3.1 Analyze Project Requirements to Determine Contractual Needs	Identify and evaluate the complexity of the construction project (scope, stakeholders, risks). Determine the most appropriate form of contract (e.g., JCT, NEC, FIDIC) based on project type, delivery method, and legal requirements. Assess how procurement strategies influence contract selection.
	3.2 Prepare Contract Documentation in Line with Legal and Regulatory Requirements	Draft contract clauses that cover key areas such as payment terms, timelines, change control, dispute resolution, and liabilities. Ensure all contract documentation complies with relevant laws (e.g., contract law, health & safety, building regulations). Incorporate specifications, drawings, schedules, and other technical documents accurately.
	3.3 Collaborate with Stakeholders to Finalise and Review Contractual Terms	Consult with clients, legal teams, and project managers to confirm all parties' requirements are met. Negotiate terms to ensure fair risk allocation and mutual understanding. Review and revise documents based on feedback to finalize the contract for execution
LO 4 Develop preliminary items and specification sections for a complex construction	4.1 Analyse project requirements to identify appropriate preliminary items for inclusion in construction documentation	Demonstrate the ability to evaluate project-specific details such as site conditions, logistics, health and safety, and contract requirements to determine necessary preliminaries (e.g., site setup, access, welfare facilities).
	4.2 Produce detailed and accurate preliminary items and specification sections that align with relevant standards, regulations, and project objectives	Drafting appropriate preliminary and specification content in a professional format, ensuring it complies with codes like JCT, NEC, NBS, BS 1192, etc., and supports client and stakeholder needs
	4.3 Review and justify the selection of specification content in relation to project performance, sustainability, and cost-effectiveness.	Reflect on the choices and provide justification for materials, methods, and preliminaries selected, considering cost, performance, environmental impact, and project goals.

Essential Reading and Resource List

Textbooks:

Cartlidge, D. (2022) *Quantity surveying practice.* 3rd ed. Abingdon: Routledge.
Brook, M. (2022) *Estimating and tendering for construction work.* 5th ed. Abingdon: Routledge.
Shen, Q., and Liu, G. (2020) *Managing complex construction projects: A systems approach*. New York: Springer.

Journals & Newspapers

Bhumi, The Planning Research Journal
Construction Journal
Construction and Building Materials
Construction Week
Construction Executive
International Journal of Scientific Research and Management (IJSRM)
Journal of Financial Management of Property and Construction
Journal of Construction Engineering and Management

Websites:

https://www.rics.org
https://www.rics.org/uk/products/data-products/bcis/
https://www.ciob.org
https://fidic.org
https://source.thenbs.com

Industry Investigation and Employment

Unit Title	Industry Investigation and Employment
Unit Code	5COM3
Unit Level	Level 5
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand and develop skill sets to secure a job in the industry.

Unit Objectives

- To study industry Trend and labor market
- To assess the competency needs
- To prepare CVs and for interviews
- To secure a job

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Assess personal competency needs within the context of employment	1.1 Industry Analysis for employment	Industry Overview: What does the industry do? Key players; Market size and growth trends; Employment Statistics; Number of people employed; Growth/decline in employment; Major job roles. Key Drivers of Employment: Technological advancements, consumer demand, government policies, and economic factors. Urbanisation: Growing cities drive demand for housing and infrastructure. Government Infrastructure Spending: Stimulus packages and infrastructure bills. Technological Integration: Skills in Demand; Technical and soft skills; Certification or degree requirements; Trends & Challenges; Automation; Remote work; Regulatory issues; Labor shortages/surpluses; Outlook; Projected job growth; emerging roles; long-term stability.
	1.2 Job investigation	Job or career path; finding job openings; potential employer; job market analysis; Company culture and values; Salary and benefits; Work-life balance; Employee reviews; Opportunities for growth; Job stability and reputation; Responsibilities; Job Market & Demand; Salary Range; Qualifications; Membership of professional bodies; Career Growth Paths; Job Market Research & Trends: LinkedIn Talent Insights; Indeed Hiring Lab; Google Trends + Google Job Search API; Lightcast.
	1.3 Competency analyses	Core Competencies; Technical Competencies; Behavioral / Interpersonal Competencies; Managerial / Strategic Competencies.
LO 2 Asses the competency needs for the industry	2.1 Review industry operations in order to identify personal development needs	Industry Trends; Objective; Read industry reports; Emerging technologies and practices. Industry Conferences, webinars, expert podcasts; Are there new tools or platforms becoming standard; growing emphasis on data; sustainability; automation; Benchmark Key Roles and Competencies; Compare your role to industry standards; Action Steps: Review job descriptions for similar roles in leading organisations. Examine LinkedIn profiles of professionals in similar positions. Competency frameworks

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	2.2 Undertake a skills audit to define areas of personal learning needs	Learning styles: visual, aural, verbal, physical, logical, social, and solitary; Identifying own learning style. Continuous Professional Development (CPD): Training versus development; personal need versus employer need. Identifying personal needs: skills audit, future plans, employer needs, skills gaps, and company goals.
	2.3 Develop a personal development plan (PDP)	Setting goals: SMART goals (specific, measurable, attainable, relevant, time-bound); learning goals versus employment goals. Learning plan: goals, actions, resources. Personal Development Plan (PDP); Personal Vision Statement; Strengths; Areas for Improvement; Action Plan; Resources; Support Network; Mentor/Coach; Peers/Colleagues; Family/Friends; Communities/Groups; Review and Reflection; Next Review Date.
LO 3 Be able to manage social media for employment industry update	3.1 Select social media to find employment.	LinkedIn; X; Facebook; Instagram; TikTok; Professional networking; up-to-date profile; Using keywords from desired industry; following relevant groups, companies and recruiters; Engage with posts and share insights to stay visible; Open to Work. Hashtags: Share thoughts on industry trends to showcase expertise. Create short videos to share your resume, job search tips, or career journey; Consistency; Clean up your profiles; Engage

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	3.2 Content management of social media	Planning, creating, scheduling, publishing, and analysing content across various social platforms. Strategy Development: Audience Research; Platform Selection; Goals & KPIs. Content Planning: Content Calendar; Content Mix; Content Creation: Design & Copywriting; Formats; Branding Scheduling & Publishing: Tools; Best Times to Post Community Management; Engagement; DMs; Moderation; Relationship Building; Analytics & Reporting; Track Metrics; Reports. Optimization: A/B Testing; Trend Adaptation Consistency Across Platforms
	3.3 Develop professional Network in social media	Choose the Right Platforms; Profile Optimization; Professional Photo; Summary/About Section. Professional background, skills, and goals; Share Valuable Content; Engage Consistently; Connect Strategically; Join industry-specific groups or hashtags; Tag people or companies; Attend virtual events or webinars; Follow industry leaders
LO 4 Be able to secure employment	4.1 Search an employment opportunities	Job search: Job title or field; Industry; Location; Remote, hybrid, or specific cities; Work type: ull-time, part-time, freelance, internships Online Job Boards: LinkedIn, Indeed, Glassdoor, Monster; Remote OK (for remote work); career websites Search using keywords; Set Up Alerts and Use Filters;

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	4.2 Apply for a jobs	Covering Letter: Tailor it to the Job; Concise (1 Page Max, 3–4 paragraphs, Professional Language) Salutation; Show Enthusiasm and Personality; Focus on Achievements; Quantitative information; End with a Call to Action; Express interest in an interview; Thanking; Format Professionally; Application forms; online application Customize cover letter; Don't mass-apply; Track your applications (e.g., in a spreadsheet or with tools like Notion or Huntr). Network; reach out to people in your industry on LinkedIn; attend job fairs or online events. Be Consistent; Set a routine—apply for a few jobs every day CV template; writing or editing CV; Microsoft Word Templates; Minimalist CV by Hloom; Google Docs' built-in templates; Spearmint Template; Canva; Sure! Here are some solid CV writing tips to help you craft a standout resume, whether you're aiming for your first job or levelling up in your career. Key Principles: Tailor it to the Job; Concise; Clean Format. Word count Essential Sections: Contact Information; Personal Profile (Optional); Key Skills; Work Experience (reverse chronological order); Education; Certifications & Training; Use Action Verbs (managed, developed, increased, led, optimized); Quantify Achievements; Avoid Jargon Unless it's industry-specific. Check Spelling & Grammar; someone else to proofread; Save as PDF.
	4.3 Face an Iinterview	Research the company; Practice common interview questions, general questions, and Role-specific questions; STAR Method for Behavioral Questions; Prepare Questions for the Interviewer; Logistics and Appearance; Follow Up. Types of interview questions: General or Traditional Questions; Behavioral Questions; Situational or Hypothetical Questions; Technical or Skill-Based Questions; Case Study or Problem-Solving Questions; Cultural Fit Questions; Brainteasers or Puzzle Questions

Essential Reading and Resource List

Textbooks:

Bolton, G. (2014) *Reflective Practice Writing and Professional Development.* London: Sage Publications Ltd.
Chandler, I., and McCarthy, J. (2022) *Your graduate job search made easy.* 5th ed. Bath: Trotman.
Green, M. (2021) *Careers in construction: Building a sustainable future.* Abingdon: Routledge.
Lussier, R. N., and Hendon, J. R. (2021) *Human resource management: Functions, applications, and skill development.* 5th ed. Los Angeles: SAGE Publications.
Pritchard, A. (2006) *Ways of Learning: Learning Theories and Learning Styles in the Classroom.* Abingdon: Routledge.
Raelin, J.A. (2008) *Work-based Learning: Bridging Knowledge and Action in the Workplace*. London: Jossey-Bass.
Tarrant, P. (2013) *Reflective Practice and Professional Development.* London: Sage.

Journals & Newspapers:

Journal of Industrial Relations
Industrial and Labor Relations Review
European Journal of Industrial Relations
The Wall Street Journal (WSJ)
Harvard Business Review (HBR)

Websites:

https://www.ciob.org
https://www.goconstruct.org

Contract and Management

Unit Title	Contract and Management
Unit Code	5ENGG4
Unit Level	Level 5
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

unit intends for the learners to understand and develop skill sets to draft construction contracts.

Unit Objectives

- To explore the scope, types and parties to construction contracts.
- To incorporate all types of terms and clauses into construction contract
- To know the regulatory requirements of construction contract
- To know alternative dispute resolution options to resolve problems

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO1 BE able to explore the scope, types and parties to construction contract.	AC -1 Discuss the Project Scope and Objectives	Definition of Work Deliverables: milestones expected outputs at each stage. Specifications and Standards: Compliance with industry standards, codes, and client-specific requirements.
	AC -2 Analyses the types of contracts.	Lump Sum (Fixed Price): Cost-Plus: Reimbursement of actual costs plus a fee. Design-Build: A single entity responsible for both design and construction. Construction Management or Management Contracting: The client appoints a manager to oversee the works.
	AC-3 Identify the parties to the Contract	Client (Employer) Contractor; Consultants, Architects, engineers, quantity surveyors, Subcontractors; Suppliers
LO 2 Be able to incorporate the conditions of contract.	AC 2.1 Negotiate terms of Time and Schedule	Commencement Date: Completion Date: Programme of Works: timeline of activities and dependencies. EOT; Delay Penalties (Liquidated Damages):
	AC 2.2 Negotiate Terms of Price & Payment Terms	Interim Payments: Final Account; Payment Retention: until the defects liability period ends. Valuation of Work: Done by a Quantity Surveyor or Contract Administrator.
	AC 2.3 Negotiate terms of Change Control	Variation Procedure: Cost Impact: Evaluation of cost adjustments. Time Impact: Assessment of changes on project duration.
Lo 3 Be able to incorporate regulatory requirements of construction contract	AC 3.1 Discus Quality and Compliance of contractual liabilities	Inspection and Testing: Defects Liability Period: Warranties and Guarantees:
	AC 3.2 Analyse Risk Allocation and Insurance in contracts	Contractor's Risk: Damage to works, injury to workers, etc. Client's Risk: Site conditions, force majeure, Insurances; Contractors All Risks (CAR) Public Liability Insurance Professional Indemnity Insurance (for consultants)

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	AC 3.3 Analyse Health, Safety, and Environmental (HSE) Requirements	Compliance: With local and national HSE legislation. Site Safety Plans: Often required before mobilisation. Sustainability Requirements: Waste management, energy use, etc.
Lo 4 Be able to incorporate Dispute Resolution Clauses	AC 4.1 Dispute Resolution	Mechanisms: Negotiation; Mediation; Adjudication; Arbitration; Litigation Jurisdiction and Governing Law.
	AC 4.2 incorporate Termination Clauses	Client's Right to Terminate: For contractor default, insolvency, or convenience. Contractor's Right to Terminate: For non-payment or prolonged suspension of works. Consequences of Termination: Payments due, handover of work, and liabilities.
	AC 4.3 Communicate and Report progress of execution	Project Meetings: Regular meetings for updates and issue resolution. Reporting Requirements: Progress reports, cost reports, etc. Notices and Instructions: Formal processes for contractual communication.

Essential Reading and Resource List

Textbooks:

Cartlidge, D. (2020) *Construction project manager's pocket book.* 2nd ed.Abingdon: Routledge.
Chappell, D. (2015) *Construction Contracts Questions and Answers.* 3rd ed. Abingdon: Routledge.
Godwin, W. (2013) *International Construction Contracts: A Handbook.* Chichester, West Sussex: Wiley-Blackwell.
Gould, N., and Willis, C. (2019) *Keating on construction contracts.* 11th ed. UK: Sweet & Maxwell.
Murdoch, J., and Hughes, W. (2021) *Construction contracts: Law and management.* 7th ed. Abingdon: Routledge.
Walker, A. (2015) *Project management in construction.* 6th ed. New Jersey: Wiley-Blackwell.

Journals & Newspapers:

Construction Management and Economics
Contract Management Magazine
Journal of Contract Management (JCM)
Journal of Legal Affairs and Dispute Resolution in Engineering and Construction
International Journal of Commerce and Contracting (IJCC)
Lexisnexis

Websites:

https://www.rics.org
https://www.jctltd.co.uk
https://fidic.org
https://www.designingbuildings.co.uk/wiki/Procurement_and_contracts

MEP Services

Unit Title	MEP Services
Unit Code	5QS5
Unit Level	Level 5
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand, develop skill sets and apply research skills for research projects.

Unit Objectives

- To understand mechanical services provided for buildings
- To understand electrical services provided for buildings
- To understand plumbing services provided for buildings
- To understand firefighting services provided for buildings
- To Produce bill of quantities using MEP drawing

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Be able to understand mechanical services provided for a building	1.1 Identify MEP (Mechanical, Electrical and Plumbing) services	Definition of MEP Services, Functions of MEP Systems, Mechanical Systems: Heating, Ventilation, and Air Conditioning (HVAC), Building Exhaust Systems, Electrical Systems: Power Distribution, Lighting Systems, CCTV and Security Systems, Access Control Systems, Plumbing Systems: Water Supply and Distribution, Drainage and Sewage Systems, Fire Alarm and Detection Systems: Fire Protection Systems, Roles and responsibilities of a MEP QS in a construction industry How MEP services provided, how MEP services affect the building facilities, different systems provided for medium scale/high scale projects, Temperature Control, Air Quality, Humidity Control, Importance of Fire Protection: MEP systems include fire alarm and suppression systems, Emergency Lighting, security systems
	1.2 Understand mechanical system in the MEP services	Fundamentals of HVAC system, types of HVAC system, Refrigeration system, Heating system, type of heating system – furnace, boiler, heat pump cooling system: Type of cooling systems; central, air, mini-split, Refrigerant and environmental considerations, Ventilation and exhaust system : ventilation types (natural, mechanical, filtration and purification methods), ventilation equipment, ductwork design and consideration Air Conditioners (ACs): Central or split systems for cooling spaces. Heating Units: Furnaces, boilers, heat pumps. Ventilation Systems: Ductwork, exhaust fans, and air intake systems for fresh air circulation. Thermostats, Humidifiers/Dehumidifiers, Filters, Cooling/Heating Coils, Dampers, Mixing Chambers, Outdoor Units, Indoor Units (Fan Coil Units), Refrigerant Lines, Controls and Sensors
	1.3 Understand the mechanism of mechanical systems	Introduction to Refrigeration cycle, Importance of Refrigeration, Components of the Refrigeration Cycle, Boilers, Chillers, Pumps, Cooling Towers, Fans and Blowers, Ductwork, Heat Exchangers, Compressors, variable air volume box, constant volume box, grills, diffusers, types of diffusers, registers, dampers, types of dampers, air curtains, ducts, type of ducts, duct materials, duct shapes, computer room AC units, function of each component, installation requirement

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 2 Be able to understand electrical services provided for a building	2.1 Understand electrical services provided for a building	Introduction to electrical services, Power Generation process, transmission system and Distribution process, Supply and Distribution of low voltage, Understand the hazards of electricity. Voltage increase/decrease process, Alternative power supply system, Main switchboard, High voltage switchgear, Single-phase and three-phase electricity, Circuit protection Transformers, electrical distribution and switchgear, cables, bus bars and cable management, introduction to lighting system, components of lighting system, power supply systems, components of power supply system, circuit path layout, High voltage equipment, Medium voltage equipment, low voltage equipment, Extra voltage equipment, Circuit protection: Fuses and circuit breakers, Light sources and Lightning Protection Systems
	2.2 Understand the power supply equipment in electrical services	Power distribution equipment: meter, Main distribution panel, sub-panels, circuit breakers, Bus bars, High voltage switch, Distribution Board, Protective system for circuit, construction of a cable, cable code identification, type of lights, type of switches Closed circuit television and Security system, Telecommunication, data and Intercom system, fire alarm system, Access control system, Intrusion detection system, vehicle barrier system, public address system Satellite Master Antenna/Master Antenna television system
	2.3 Develop the electrical and ELV system with layouts	Telephone system diagram, Satellite Master Antenna television system diagram, Closed circuit television and Security system diagram, Lighting system diagram, power supply system diagram, Circuit path diagram, Single line (schematic) diagram; Telephone Junction box, TV junction box, splitter box, SMATV cabinet, Telephone block, Main distribution frame, intermediate distribution frame, miniature circuit breaker, moulded case circuit breaker, Earth leakage circuit breaker, Air circuit breaker, Residual current circuit breaker, sub main switchboard, sub main distribution board, Switch socket outlet, shaver socket outlet

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 3 Be able to understand plumbing services provided for a building	3.1 Understand water supply services in a building	Introduction to water supply systems, sources of water supply, municipal water supply, private well water supply systems, rainwater harvesting, cold water, hot water circulating systems, irrigation systems, and types of fixtures and fittings. Domestic Water Tank (or Underground Reservoir), Elevated Roof Tank or Overhead tank, heater/ geyser, pump, pipe, pipe types, pipe materials, Solar Water Heater, Function of valves, Valves : gate valve, globe valve, butterfly valve, floating valve, stop valve, check valve, solar water heater,
	3.2 Analyze the waste disposal system and equipment provided for a building	Introduction to waste disposal system, Solid waste, collections, treatments and disposal; wastewater disposal system; wastewater treatment process; Storage of waste at source, collection, segregation, transportation of waste, Disposal of solid wastes, plumbing terminology and fixtures: terms used in drainage system, different types of plumbing fixtures, Soil and wastewater drain, building vertical stack, Branch drain/discharge pipe, horizontal drain, Design of horizontal drains by discharge unit method, External foul water drainage for building Sanitary pipes, fittings and fixtures; Layout and design; Principles of sanitation, Introduction to various waste disposal pipes, joints, fittings and fixtures, their function, placement and constructional details, internal & external drainage system of various buildings, including small residences, apartments, public buildings, etc. Single stack system, one pipe and two pipe systems, testing of house drains, waste sump
	3.3 Develop rain water system and its functionality	Principles of stormwater drainage, rainwater harvesting, Principles of stormwater disposal process, Types of storm pipes, stormwater gutters/storage sumps, Recycling of storm water, advantages of rainwater recycling, vent pipe system, purpose of venting, advantages of vent system, type of vent, concept of grey water, different pipe materials, fittings, supports and valves used, and purpose of each.

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 4 Be able to understand firefighting services provided for a building Fire	4.1 Comprehend the firefighting system and components	Introduction to fire protection systems, fire protection requirements for multi-storeyed buildings, fire and smoke management, active and passive fire protection systems, and various types of water-based fire protection systems like sprinkler systems, hydrant systems, and water spray & mist systems. Portable or Semi Portable Firefighting systems and fire hose reel cabinets: introduction, Types of Hydrants, Breaching Inlet, riser system, riser type identification (wet riser, dry riser, drain riser and combined riser) Types of Tanks, Essential components of Tanks, Overhead and Underground Tanks, Pumps, Fire Protection System: Classifications; Fire Pumps; Hydrant System; Wet Riser; Dry Riser; riser pipe materials; riser pipe sizes; sprinkler types: conventional, upright, pendant, horizontal sidewall, vertical sidewall, recessed pendant, concealed horizontal sidewall, concealed pendant
	4.2 Analyze firefighting standards and equipment	Firefighting standards, Introduction to fire, Basic of fire, Fire Triangle, Classification of Fire (fire classes), Spread of Fire; Methods of Extinguishing Fire. Identification of fire extinguishers, Demonstration of the application of different types of extinguishers, Fire Fighting Fundamentals, fixed firefighting systems – water-based, foam, gas-based, dry chemicals, and steps to operate an extinguisher. Fire extinguishers: water extinguisher, Carbon dioxide extinguisher, wet chemical extinguisher, dry chemical extinguisher, foam extinguisher, Extinguisher identification, extinguisher color code, relevant fire classes to use suitable extinguishers, how and when to fight with fire

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	4.3 Produce bill of quantities using MEP drawing	Shop Drawings, Coordination Drawings, as built Drawings, Drawing schedule, Riser schematics, Sprinkler layout, Hydrant Layout, Equipment Schedule, Read and understand the specifications provided with the drawing, symbol identification, abbreviation identification, system reading, Preparing list of items provided in the drawing, take off measurement using the software, export measurement to an excel sheet Introduction to measurements, standard method of measurements used in the industry, firefighting pipe measurement procedure in accordance with different standard method of measurements, defining Rate, rate analysis, rate preparation using quotation for MEP services, item Description for bill of quantities, Amount calculation

Essential Reading and Resource List

Textbooks:

Althouse, A. D., Turnquist, C. H., & Bracciano, A. F. (2013) *Modern refrigeration and air conditioning.* 19th ed. Tinley Park : Goodheart-Willcox.
Bell, A. D., and Angel, W. L. (2007) *HVAC equations, data, and rules of thumb.* 2nd ed. New York : McGraw-Hill.
Brumbaugh, J. E. (2004) A*udel HVAC fundamentals, volume 1: Heating systems, furnaces, and boilers.* 4th ed. Hoboken, NJ: Wiley.
Grondzik, W. T., Kwok, A. G., Stein, B., and Reynolds, J. S. (2019) *Mechanical and electrical equipment for buildings.* 12th ed. Hoboken, NJ: Wiley.
Haines, R. W., and Myers, M. E. (2009) *HVAC systems design handbook.* 5th ed. McGraw-Hill Education.

Journals and Newspapers

Ashrae Journal
Building Services Engineering Research and Technology (BSERT)
Energy and Buildings
International Journal of Mechanical and Electrical Engineering (IJMEE)
MEP Engineer – Construction Document Repository & Site Insights
MEP Middle East
Plumbing & Mechanical Magazine

Websites:

https://fire.nv.gov/
https://app.croneri.co.uk/
https://www.nfpa.org/

Research Project

Unit Title	Research Project
Unit Code	5COM6
Unit Level	Level 5
Credit Value	20
Guided Learning Hours	100
Independent Learning Hours	100
Unit Type	Core
Grading System	Pass / Fail

Unit Introduction

This unit intends for the learners to understand, develop skill sets and apply research skills for research projects.

Unit Objectives

- To study and apply range of appropriate research skills to address problems that needs solution
- To use the literature for research purposes
- To develop a research proposal for academic purposes.
- To provide research report for range of audience

Assessment

Learning Outcomes to meet	All 4 Learning Outcomes
Assessment Criteria to cover	All ACs of each Learning Outcome
Assessment method	Coursework, Practical or other appropriate methods
Word count	3000 or Equivalent

Assignment briefs are part of this unit specification and available to all the centres and learners.
Centre assess all the units internally and B-TIC externally verify for quality assurance

On completion assessment of this module the learner should:

Learning Outcomes	Assessment Criteria	Unit Teaching Content
LO 1 Formulate a research project problem.	1.1 Identify research problem	Quality improvement, sustainability, technology, innovation, cost estimation, Risk; Cost management; Project Performance; Cost Overrun; Professional Practice; Ethics; Feasibility Studies and Cost Analysis Health and Safety
	1.2. Define the research problem	Symptoms, problem,
	1.3. Justify problem selection	Significance; time frame; budget
LO 2 review literature for business context	2.1 Critically review literature for research problem	Just in time reading; just in case reading; comparative reading; active writing; passive reading; key terms; authors; journals; books; conference papers; conference proceedings; library search; google scholar; internet; media; literature credibility; validity and reliability; citation and reference frequency; age of the source; reliability; non-bibliographic website; writing style; paraphrasing; personalizing; critical review; synthesis
	2.2 Develop research conceptual framework and hypothesis.	independent variable; dependent variable; measuring variables; indicators; qualitative variables; quantitative variable; conceptual framework; hypothesis; research objectives; research question
	2.3 Develop research objectives and research questions	Research objectives; research question
LO 3 - Be able to produce research proposal for research project.	3.1 Propose research methodologies for research project	Ontology; epistemology; methodology; philosophy; positivism; phenomenology; subjectivism; objectivism; deductive; inductive; experiment; case study; survey; time horizon; cross sectional; longitudinal; qualitative; quantitative; Sampling; population: participants, subjects, element, sample, sampling unit, parameter, statistics; define target population; determine the sample frame; sampling technique; sample size; execution; random sampling; systematic sampling; stratified sampling; sample size; executing the sampling process

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	3.2 Evaluate different data and collection methods	Qualitative Methods: non-numerical; Interviews; Focus Groups; Observation; Case Studies; Open-ended Surveys Quantitative Methods: numerical; Surveys/Questionnaires: multiple-choice, Likert scales, or numerical responses. Experiments; Web Analytics; Google Analytics; Online Forms and Tools; Google Forms, SurveyMonkey; Social Media Monitoring
	3.3 Produce research proposal	Cover page; title; table of content; introduction; research background; research problem; research objectives; research question; significance of research; literature review; introduction; independent variable; dependent variable; conceptual framework; hypothesis Research methodology; philosophy; approach; strategy; choice; time horizon; data source; data collection Sampling; population; frame technique; size; data collection instruments; data analysis; operationalization; appendix; research questionnaire; time frame; references
LO 4 Produce project report	4.1. Analyse different data	Data analysis; qualitative analysis and quantitative analysis; presentation of data; bar chart; pie charts; graphs; statistical tables; statistical table; histogram; graphs; comparison of variables; past trends; current trends; forecasting; variables comparison; past trends; future forecasting; statistical software; SPSS; Minitab; excel; descriptive analysis; chi-squared; correlation analysis; multiple regression; one way ANOVA; two-way ANOVA; ANCOVA; Kaiser Meyer Olkin (KMO) Bartlett's test
	4.2. Interpret data analysis	Understanding the Context; Summary of Findings; Comparative Analysis; Identification of Relationships; Significance and Relevance; Correlation;

Learning Outcomes	Assessment Criteria	Unit Teaching Content
	4.3. Conclude and make recommendations for research problems	Formal report; Cover page; title; table of content; introduction; research background; research problem; research objectives; research question; significance of research; literature review; introduction; independent variable; dependent variable; conceptual framework; hypothesis Research methodology; philosophy; approach; strategy; choice; time horizon; data source; data collection Sampling; population; frame technique; size; data collection instruments; data analysis; operationalization; conclusion and recommendation;

Essential Reading and Resource List:

Textbooks:

Cameron, S. (2005) *The MBA Handbook*. Harlow: Prentice Hall.
Saunders, M., Lewis, P. and Thornhill, A. (2010) *Research Methods for Business Learners.* Harlow: Prentice Hall.
Anderson, V. (2009) *Research Methods in Human Resource Management*. London: Chartered Institute of Personnel and Development.
Binsardi, A. (2008) *Research Methods for Management.* Cambridge: International Academic Press.
Booth, A., Papaioannou, D. and Sutton, A. (2012) *Systematic Approaches to a Successful Literature Review*. London: Sage Publications.
Bryman, A. and Bell, E. (2011) *Business Research Methods.* New York: Oxford University Press.
Burns, R. P. and Burns, R. (2008) *Business Research Methods and Statistics Using SPSS.* London: Sage Publications.
Fink, A. (2009) *Conducting Research Literature Reviews*. London: Sage Publications.
Flick, U. (2011) *Your Research Project.* London: Sage Publications.
Jesson, J. K., Matheson, L. and Lacey, F. M. (2011) *Doing Your Literature Review.* London: Sage Publications.
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