# ICTQual AB

## Qualification Specification

# Level 4 Diploma in Civil Engineering
# 120 Credits – One Year


**Website**
www.ictqualab.co.uk

**Email:**
Support@ictqualab.co.uk

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## Contents

# Qualification Specifications about

# ICTQual Level 4 Diploma in Civil Engineering 120 Credits – One Year

## About ICTQual AB

ICTQual AB UK Ltd. is a distinguished awarding body based in the United Kingdom, dedicated to fostering excellence in education, training, and skills development. Committed to global standards, ICTQual AB provides internationally recognized qualifications that empower individuals and organizations to thrive in an increasingly competitive world. Their offerings span diverse industries, including technical fields, health and safety, management, and more, ensuring relevance and adaptability to modern workforce needs.

The organization prides itself on delivering high-quality educational solutions through a network of Approved Training Centres worldwide. Their robust curriculum and innovative teaching methodologies are designed to equip learners with practical knowledge and skills for personal and professional growth. With a mission to inspire lifelong learning and drive positive change, ICTQual AB continuously evolves its programs to stay ahead of industry trends and technological advancements.

ICTQual AB's vision is to set benchmarks for educational excellence while promoting inclusivity and integrity. Their unwavering focus on quality and accessibility makes them a trusted partner in shaping future-ready professionals and advancing societal progress globally.

## Course Overview

The ICTQual Level 4 Diploma in Civil Engineering is a comprehensive one-year program designed to provide learners with foundational knowledge and practical skills necessary for a successful career in civil engineering. This diploma focuses on core areas such as structural design, construction methods, surveying techniques, and sustainable engineering practices. By integrating theoretical understanding with hands-on training, students gain the ability to address real-world engineering challenges.

This program is suitable for those aspiring to work in diverse roles within the civil engineering sector, including site management, project coordination, and structural analysis. It also prepares learners for further studies, serving as a stepping stone to advanced qualifications or professional certifications in the field.

Key features of the program include access to modern learning facilities, interactive workshops, and exposure to industry-standard tools like AutoCAD and GIS technologies. Upon successful completion, graduates will be equipped to contribute to infrastructure projects, uphold ethical standards, and meet the growing demands of sustainable development in civil engineering.

## Certification Framework

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| **Qualification title** | **ICTQual Level 4 Diploma in Civil Engineering 120 Credits – One Year** |
| **Course ID** | CE0003 |
| **Qualification Credits** | 120 Credits |
| **Course Duration** | 1 Year |
| **Grading Type** | Pass / Fail |
| **Competency Evaluation** | Coursework / Assignments / Verifiable Experience |
| **Assessment** | The assessment and verification process for ICTQual qualifications involves two key stages:<br><br>**Internal Assessment and Verification:**<br>✓ Conducted by the staff at the Approved Training Centre (ATC). Ensures learners meet the required standards through continuous assessments.<br>✓ Internal quality assurance (IQA) is carried out by the centre's IQA staff to validate the assessment processes.<br>**External Quality Assurance:**<br>✓ Managed by ICTQual AB verifiers, who periodically review the centre's assessment and IQA processes.<br>✓ Verifies that assessments are conducted to the required standards and ensures consistency across centres |

## Entry Requirements

To enrol in the ICTQual Level 4 Diploma in Civil Engineering 120 Credits – One Year, candidates must meet the following entry requirements:

- A minimum of a Level 3 qualification (e.g., A-Levels, NVQ Level 3, or equivalent). A background in mathematics, physics, or a related field is highly recommended.
- Minimum age of 16 years to enrol in the course.
- Basic computer skills, which are necessary for completing assignments, managing projects, and using engineering software and tools for design, analysis, and simulation.
- While not mandatory, prior experience or exposure to construction, engineering projects, or related technical fields can provide a strong foundation for understanding course material and enhancing practical learning outcomes.

## Qualification Structure

This qualification comprises 12 mandatory units, totalling 120 credits. Candidates must successfully complete all mandatory units to achieve the qualification.

| Mandatory Units | | |
|---|---|---|
| **Unit Ref#** | **Unit Title** | **Credits** |
| CE0003-1 | Introduction to Civil Engineering | 10 |
| CE0003-2 | Materials Science and Engineering | 10 |
| CE0003-3 | Surveying Techniques and Equipment | 10 |
| CE0003-4 | Structural Analysis and Design | 10 |
| CE0003-5 | Geotechnical Engineering | 10 |
| CE0003-6 | Construction Technology and Methods | 10 |
| CE0003-7 | Environmental and Sustainability Issues in Civil Engineering | 10 |
| CE0003-8 | Project Management in Civil Engineering | 10 |
| CE0003-9 | Construction Safety and Risk Management | 10 |
| CE0003-10 | Hydraulics and Water Engineering | 10 |
| CE0003-11 | Transportation Engineering and Planning | 10 |
| CE0003-12 | Civil Engineering Design Project | 10 |

## Centre Requirements

Even if a centre is already registered with ICTQual AB, it must meet specific requirements to deliver the ICTQual Level 4 Diploma in Civil Engineering 120 Credits – One Year. These standards ensure the quality and consistency of training, assessment, and learner support.

**1. Approval to Deliver the Qualification**

- ✓ Centres must obtain formal approval from ICTQual AB to deliver this specific qualification, even if they are already registered.
- ✓ The approval process includes a review of resources, staff qualifications, and policies relevant to the program.

**2. Qualified Staff**

- ✓ **Tutors:** Must have relevant qualifications in civil engineering or construction at Level 5 or higher, alongside teaching/training experience.
- ✓ **Assessors:** Must hold a recognized assessor qualification and demonstrate expertise in civil engineering
- ✓ **Internal Quality Assurers (IQAs):** Must be appropriately qualified and experienced to monitor the quality of assessments.

**3. Learning Facilities**

Centres must have access to appropriate learning facilities, which include:

- ✓ **Classrooms:** Modern classrooms equipped with multimedia tools to deliver engaging theoretical instruction on structural design, construction methods, and sustainable engineering practices.
- ✓ **Practical Areas**: Hands-on training areas with advanced equipment for material testing, surveying instruments, concrete mixing, and structural analysis, providing practical experience in real-world civil engineering applications.
- ✓ **Technology Access:** High-performance computers with industry-standard software (e.g., AutoCAD, STAAD.Pro, Revit, and GIS tools) and reliable internet connectivity for drafting, modelling, and project management tasks.

**4. Health and Safety Compliance**

- ✓ Centres must ensure that practical training environments comply with relevant health and safety regulations.
- ✓ Risk assessments must be conducted regularly to maintain a safe learning environment.

**5. Resource Requirements**

- ✓ Learning Materials: Approved course manuals, textbooks, and study guides aligned with the curriculum.
- ✓ Assessment Tools: Templates, guidelines, and resources for conducting and recording assessments.
- ✓ E-Learning Systems: If offering online or hybrid learning, centres must provide a robust Learning Management System (LMS) to facilitate remote delivery.

**6. Assessment and Quality Assurance**

- ✓ Centres must adhere to ICTQual's assessment standards, ensuring that all assessments are fair, valid, and reliable.
- ✓ Internal quality assurance (IQA) processes must be in place to monitor assessments and provide feedback to assessors.
- ✓ External verification visits from ICTQual will ensure compliance with awarding body standards.

**7. Learner Support**

- ✓ Centres must provide learners with access to guidance and support throughout the program, including:
- ✓ Academic support for coursework.
- ✓ Career guidance for future progression.
- ✓ Additional support for learners with specific needs (e.g., disabilities or language barriers).

**8. Policies and Procedures**

Centres must maintain and implement the following policies, as required by ICTQual:

- ✓ Equal Opportunities Policy.
- ✓ Health and Safety Policy.
- ✓ Safeguarding Policies and Procedures.
- ✓ Complaints and Appeals Procedure.
- ✓ Data Protection and Confidentiality Policy.

**9. Regular Reporting to ICTQual**

- ✓ Centres must provide regular updates to ICTQual AB on learner enrolment, progress, and completion rates.
- ✓ Centres are required to maintain records of assessments and learner achievements for external auditing purposes.

## Support for Candidates

Centres should ensure that materials developed to support candidates:

- ✓ Facilitate tracking of achievements as candidate's progress through the learning outcomes and assessment criteria.
- ✓ Include information on how and where ICTQual's policies and procedures can be accessed.
- ✓ Provide mechanisms for Internal and External Quality Assurance staff to verify and authenticate evidence effectively.

This approach ensures transparency, supports candidates' learning journeys, and upholds quality assurance standards.

## Assessment

This qualification is competence-based, requiring candidates to demonstrate proficiency as defined in the qualification units. The assessment evaluates the candidate's skills, knowledge, and understanding against the set standards. Key details include:

1. **Assessment Process:**

    - ✓ Must be conducted by an experienced and qualified assessor.
    - ✓ Candidates compile a portfolio of evidence that satisfies all learning outcomes and assessment criteria for each unit.

2. **Types of Evidence:**

    - ✓ Observation reports by the assessor.
    - ✓ Assignments, projects, or reports.
    - ✓ Professional discussions.
    - ✓ Witness testimonies.
    - ✓ Candidate-produced work.
    - ✓ Worksheets.
    - ✓ Records of oral and written questioning.
    - ✓ Recognition of Prior Learning (RPL).

3. **Learning Outcomes and Assessment Criteria:**

    - ✓ **Learning Outcomes:** Define what candidates should know, understand, or accomplish upon completing the unit.
    - ✓ **Assessment Criteria:** Detail the standards candidates must meet to demonstrate that the learning outcomes have been achieved.

This framework ensures rigorous and consistent evaluation of candidates' competence in line with the qualification's objectives.

## Unit Descriptors

**CE0003 -1: Introduction to Civil Engineering**

This study unit aims to provide learners with a foundational understanding of civil engineering's pivotal role in shaping society. It explores the diverse sectors within the industry, highlighting historical advancements and their influence on modern practices. The unit also aims to introduce key career pathways and the essential skills required for success, fostering an informed perspective on the profession's significance and opportunities.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Understand the role of civil engineering in society and the various sectors within the industry.** | 1.1. Demonstrates a clear understanding of the role of civil engineering in addressing societal needs and infrastructure development.<br>1.2. Identifies the various sectors within the civil engineering industry, including transportation, water resources, and structural engineering.<br>1.3. Explains the impact of civil engineering projects on communities, the environment, and economic development.<br>1.4. Recognises the interconnections between civil engineering and other disciplines, such as urban planning and environmental science.<br>1.5. Understands the ethical and social responsibilities of civil engineers in shaping sustainable and resilient infrastructure.<br>1.6. Applies knowledge of civil engineering's role in society to assess the importance of engineering solutions in addressing global challenges. |
| **1. Identify key career opportunities and the skills required to succeed in civil engineering.** | 2.1 Identifies key career opportunities within the civil engineering field, such as project management, design, and construction roles.<br>2.2 Demonstrates understanding of the essential skills required for success in civil engineering, including technical expertise, problem-solving, and project management.<br>2.3 Recognises the importance of communication and teamwork in civil engineering career progression.<br>2.4 Understands the value of continuous professional development and obtaining relevant certifications to enhance career |

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| | prospects.<br>2.5 Highlights the role of specialisations, such as structural or environmental engineering, in shaping career paths.<br>2.6 Demonstrates awareness of emerging trends and technologies in civil engineering and their impact on career opportunities. |
| **2. Recognize the history and evolution of civil engineering practices.** | 3.1 Demonstrates an understanding of the historical development of civil engineering and its key milestones.<br>3.2 Recognises significant civil engineering innovations and how they have shaped modern practices and infrastructure.<br>3.3 Identifies the evolution of materials, techniques, and technologies used in civil engineering over time.<br>3.4 Acknowledges the contributions of historical engineers and their impact on the field of civil engineering.<br>3.5 Explains how past civil engineering challenges have influenced current practices and design solutions.<br>3.6 Understands the role of civil engineering in shaping society's infrastructure and its ongoing evolution in response to global needs. |

**CE0003 -2: Materials Science and Engineering**

The aim of this study unit is to provide learners with a comprehensive understanding of construction materials, focusing on their properties, performance, and applications in civil engineering. Students will develop the ability to critically evaluate material suitability for diverse engineering projects, ensuring optimal performance and sustainability.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Analyse the properties of construction materials such as concrete, steel, and composites.** | 1.1. Demonstrates a thorough understanding of the physical and mechanical properties of construction materials such as concrete, steel, and composites.<br>1.2. Analyses the strength, durability, and performance characteristics of different materials in various construction applications.<br>1.3. Evaluates the suitability of materials for specific engineering projects, considering factors like load-bearing capacity and environmental conditions.<br>1.4. Understands the influence of material properties on design, construction processes, and long-term performance.<br>1.5. Compares the advantages and limitations of concrete, steel, and composite materials in terms of cost, sustainability, and application.<br>1.6. Applies knowledge of material properties to inform decisions on material selection in civil engineering design and construction. |
| **2. Evaluate the suitability of materials for different types of civil engineering projects.** | 2.1 Assesses the performance characteristics of materials in relation to the specific requirements of civil engineering projects.<br>2.2 Evaluates the environmental impact, sustainability, and long-term durability of materials for different construction applications.<br>2.3 Considers factors such as load-bearing capacity, cost-effectiveness, and availability when selecting materials for projects.<br>2.4 Analyzes the compatibility of materials with project-specific design standards and engineering specifications.<br>2.5 Recognises the importance of material selection in ensuring safety, functionality, and efficiency in civil engineering projects.<br>2.6 Applies knowledge of material properties to make informed decisions that optimise project |

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| | outcomes while minimising risks. |
| **3. Apply knowledge of material testing methods to ensure durability and strength in construction.** | 3.1 Demonstrates understanding of various material testing methods, including compressive, tensile, and shear testing, to assess material strength.<br>3.2 Applies appropriate testing procedures to evaluate the durability and long-term performance of construction materials under different conditions.<br>3.3 Interprets material test results to determine the suitability of materials for specific construction applications.<br>3.4 Ensures that material testing is conducted according to relevant industry standards and regulations to guarantee quality and safety.<br>3.5 Utilises test data to inform material selection and design decisions, ensuring optimal strength and durability for construction projects.<br>3.6 Incorporates the results of material testing into the overall quality assurance and quality control processes for construction projects. |

**CE0003 -3: Surveying Techniques and Equipment**

This study unit aims to provide learners with a solid foundation in surveying principles and practices essential for civil engineering projects. The focus is on developing practical skills in using surveying equipment and techniques to measure and analyse distances, angles, and elevations accurately.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Demonstrate proficiency in using surveying equipment and techniques for measuring distances, angles, and elevations.** | 1.1. Demonstrates proficiency in using surveying equipment, such as total stations, levels, and GPS systems, to measure distances, angles, and elevations accurately.<br>1.2. Applies appropriate surveying techniques to ensure precision in data collection and measurement for civil engineering projects.<br>1.3. Utilises surveying equipment to create accurate site layouts and topographical maps for construction planning and design.<br>1.4. Interprets and records measurement data accurately, ensuring consistency with project specifications and standards.<br>1.5. Understands the limitations and calibration requirements of surveying equipment to ensure reliable and accurate results.<br>1.6. Effectively communicates survey results, integrating them into project designs and engineering plans for further analysis and implementation. |
| **2. Interpret and apply surveying data for civil engineering projects.** | 2.1 Accurately interprets surveying data, including measurements of distances, angles, and elevations, to inform civil engineering designs.<br>2.2 Applies surveying data to create precise site plans, topographical maps, and cross-sectional profiles for construction projects.<br>2.3 Integrates surveying data into the planning, design, and execution phases of civil engineering projects, ensuring alignment with project goals.<br>2.4 Identifies discrepancies or inconsistencies in survey data and takes corrective actions to maintain data integrity.<br>2.5 Utilises surveying data to support decision-making in areas such as site selection, grading, and infrastructure design.<br>2.6 Ensures the proper application of surveying data to meet regulatory, safety, and engineering standards throughout the project |

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| | lifecycle. |
| **3. Understand modern advancements in surveying technologies and their impact on construction accuracy.** | 3.1 Demonstrates understanding of modern surveying technologies, such as 3D laser scanning, drones, and LiDAR, and their application in civil engineering projects.<br>3.2 Recognises the advantages of advanced surveying tools in improving the accuracy and efficiency of measurements and data collection.<br>3.3 Explains how modern surveying technologies enhance the precision of construction layouts, reducing errors and rework.<br>3.4 Assesses the impact of new technologies on project timelines, costs, and overall construction quality.<br>3.5 Integrates advancements in surveying technologies into the planning and execution of civil engineering projects to optimise outcomes.<br>3.6 Understands the role of data processing and analysis software in transforming surveying data into actionable insights for construction teams. |

**CE0003 -4: Structural Analysis and Design**

The aim of this study unit is to develop a comprehensive understanding of the principles and practices of structural engineering. Learners will acquire the ability to analyse and design structural components, ensuring their stability, safety, and functionality. By integrating theoretical knowledge with practical application, this unit prepares learners to address real-world challenges in structural engineering, utilizing industry-standard codes and methodologies.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Analyse forces, moments, and load distributions in various structures.** | 1.1. Demonstrates the ability to identify and calculate forces, moments, and load distributions acting on different structural components.<br>1.2. Applies fundamental principles of statics and mechanics of materials to analyse the behaviour of structures under various loading conditions.<br>1.3. Utilises engineering software and analytical methods to model and solve complex structural systems and load distributions.<br>1.4. Assesses the impact of different types of loads, including dead, live, wind, and seismic forces, on the stability and integrity of structures.<br>1.5. Identifies potential points of failure or excessive stress in structures based on load analysis and recommends appropriate design adjustments.<br>1.6. Interprets results from force and moment analysis to inform the selection of materials, structural design, and safety considerations. |
| **2. Design simple structural elements such as beams, columns, and foundations using appropriate engineering methods.** | 2.2 Applies fundamental principles of structural design to create safe and efficient beam, column, and foundation designs.<br>2.3 Utilises relevant design codes and standards to ensure compliance with safety, load-bearing capacity, and stability requirements.<br>2.4 Selects appropriate materials and cross-sectional shapes for beams, columns, and foundations based on load and environmental conditions.<br>2.5 Calculates required dimensions, reinforcement, and material strengths for structural elements to meet project specifications.<br>2.6 Evaluates the impact of different loading conditions, including static and dynamic loads, |

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| | on the design of structural elements.<br>2.7 Integrates design considerations, such as cost-effectiveness and constructability, into the overall design of simple structural elements. |
| **3. Apply structural design codes and standards to ensure safety and stability.** | 3.1 Demonstrates a thorough understanding of relevant structural design codes and standards, including local and international regulations.<br>3.2 Applies appropriate design codes to ensure compliance with safety, load-bearing capacity, and stability requirements for various structural elements.<br>3.3 Ensures that all structural designs meet or exceed the minimum requirements for safety and durability as stipulated by applicable standards.<br>3.4 Incorporates considerations such as material strengths, environmental factors, and load factors in line with design codes and standards.<br>3.5 Conducts design checks and verification to confirm that all calculations and assumptions comply with the latest engineering codes.<br>3.6 Stays updated on changes to structural design codes and standards, applying the most current practices to ensure the safety and stability of structures. |

**CE0003 -5: Geotechnical Engineering**

The aim of this study unit is to provide learners with a solid foundation in geotechnical engineering principles, focusing on the mechanics and behaviour of soil and rock in engineering applications. It enables students to acquire the skills necessary to perform soil testing, interpret findings, and apply these insights to foundation design and ground condition assessments for construction projects. This unit prepares learners to address geotechnical challenges in diverse civil engineering contexts with confidence and precision.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Understand soil mechanics and the behaviour of soil and rock in engineering contexts.** | 1.1. Demonstrates an understanding of the fundamental principles of soil mechanics, including soil classification, properties, and behaviour.<br>1.2. Analyses the interaction between soil, rock, and structural loads to assess their impact on engineering designs and construction processes.<br>1.3. Recognises the significance of soil compaction, shear strength, permeability, and consolidation in determining soil behaviour in various conditions.<br>1.4. Applies knowledge of geotechnical engineering to evaluate soil and rock conditions at construction sites, ensuring suitability for planned structures.<br>1.5. Understands the impact of environmental factors, such as moisture content and temperature, on soil and rock stability in engineering contexts.<br>1.6. Integrates soil and rock mechanics principles into foundation design, slope stability analysis, and earthworks planning for civil engineering projects. |
| **2. Conduct soil tests and interpret results for foundation design.** | 2.1 Demonstrates proficiency in conducting various soil tests, including compaction, shear strength, permeability, and consolidation tests.<br>2.2 Accurately interprets test results to determine soil properties and assess their suitability for foundation design.<br>2.3 Applies knowledge of soil behaviour to evaluate the impact of different soil conditions on foundation stability and performance.<br>2.4 Identifies soil-related issues, such as potential for settlement or expansion, and integrates findings into foundation design recommendations. |

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| | 2.5 Utilises test data to make informed decisions about appropriate foundation types, dimensions, and construction methods.<br>2.6 Ensures that soil test procedures follow industry standards and regulatory requirements to guarantee the accuracy and reliability of results. |
| **3. Apply geotechnical principles to assess ground conditions for construction projects.** | 3.1 Utilises geotechnical principles to evaluate soil and rock properties at construction sites, ensuring the suitability for proposed foundations and structures.<br>3.2 Assesses ground conditions, including soil stability, groundwater levels, and potential geohazards, to inform project planning and design.<br>3.3 Applies knowledge of geotechnical engineering to identify risks such as subsidence, soil liquefaction, or landslides that could impact construction safety.<br>3.4 Conducts site investigations, including soil sampling and geophysical testing, to gather relevant data for geotechnical assessments.<br>3.5 Integrates findings from geotechnical assessments into the design process, recommending appropriate foundation solutions and construction methods.<br>3.6 Ensures that geotechnical assessments comply with industry standards and regulations, addressing environmental and safety concerns in project planning. |

**CE0003 -6: Construction Technology and Methods**

The aim of the study unit *Construction Technology and Methods* is to provide learners with a comprehensive understanding of modern construction practices and technologies essential in civil engineering. This unit focuses on equipping students with the knowledge to analyse and implement contemporary construction techniques, understand the complete lifecycle of construction projects, and critically evaluate innovative methods like prefabrication and modular construction for enhanced efficiency and sustainability within the industry.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Identify and apply modern construction techniques and technologies in civil engineering.** | 1.1. Demonstrates awareness of modern construction techniques, such as 3D printing, modular construction, and prefabrication, in civil engineering projects.<br>1.2. Applies innovative technologies like Building Information Modelling (BIM), drones, and advanced machinery to improve construction efficiency and accuracy.<br>1.3. Assesses the potential benefits of modern construction techniques, including cost savings, time reduction, and sustainability improvements.<br>1.4. Identifies emerging technologies and integrates them into project planning to optimise resource management, workflow, and quality control.<br>1.5. Evaluates the impact of new construction methods on safety, environmental sustainability, and long-term durability of structures.<br>1.6. Incorporates modern construction practices into design and execution to enhance the overall effectiveness and success of civil engineering projects. |
| **2. Understand the construction process, from excavation and site preparation to finishing.** | 2.1 Demonstrates knowledge of the entire construction process, including site assessment, excavation, foundation work, and structural assembly.<br>2.2 Understands the importance of site preparation, including clearing, grading, and soil stabilization, to ensure a stable foundation for construction.<br>2.3 Recognises the key stages of construction, such as formwork, reinforcement, and concrete pouring, ensuring adherence to quality and safety standards.<br>2.4 Applies knowledge of materials, equipment, and techniques used during construction to achieve project timelines and budget goals. |

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| | 2.5 Ensures proper integration of infrastructure systems, such as utilities, drainage, and access roads, throughout the construction process.<br>2.6 Understands the final finishing stages, including landscaping, installation of finishes, and quality inspections, to ensure project completion and handover. |
| **3. Evaluate the use of prefabrication, modular construction, and other innovative methods in the industry.** | 3.1 Evaluates the benefits of prefabrication and modular construction, such as reduced construction time, cost savings, and enhanced quality control.<br>3.2 Assesses the impact of innovative construction methods on project efficiency, including reduced on-site labour and faster assembly.<br>3.3 Recognises the potential for prefabrication and modular techniques to improve sustainability by minimizing waste and reducing environmental impact.<br>3.4 Identifies challenges in implementing innovative methods, such as transportation, logistics, and coordination between off-site and on-site teams.<br>3.5 Examines the role of technology, such as automation and 3D printing, in advancing the capabilities of prefabrication and modular construction.<br>3.6 Considers the long-term benefits of these methods, including durability, flexibility in design, and potential for future scalability or adaptation. |

**CE0003 -7: Environmental and Sustainability Issues in Civil Engineering**

The aim of this study unit is to develop learners' ability to integrate environmental stewardship and sustainability principles into civil engineering practices. It focuses on equipping students with the knowledge to assess the ecological impact of engineering projects, promote the adoption of eco-friendly materials and methods, and implement effective waste management and energy efficiency strategies. This unit aims to foster a proactive approach to creating sustainable solutions that align with industry standards and environmental regulations.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Evaluate the environmental impact of civil engineering projects and propose sustainable alternatives.** | 1.1. Demonstrates comprehensive understanding of the environmental impact of civil engineering projects across various phases.<br>1.2. Accurately identifies key environmental issues related to construction, operation, and decommissioning stages of projects.<br>1.3. Critically evaluates the effectiveness of existing environmental mitigation measures in civil engineering practices.<br>1.4. Proposes realistic and innovative sustainable alternatives to mitigate adverse environmental impacts.<br>1.5. Applies relevant environmental regulations, standards, and best practices in the development of sustainable solutions.<br>1.6. Justifies the proposed alternatives with sound technical, environmental, and economic reasoning. |
| **2. Apply green building practices and eco-friendly materials in design and construction.** | 2.1 Demonstrates a thorough understanding of green building practices and their application in civil engineering projects.<br>2.2 Identifies and evaluates eco-friendly materials suitable for various phases of construction.<br>2.3 Applies sustainable design principles to minimise resource consumption and environmental impact.<br>2.4 Integrates renewable energy solutions and energy-efficient systems into building designs.<br>2.5 Adheres to relevant environmental standards, certifications, and building codes during the design and construction process.<br>2.6 Justifies the use of eco-friendly materials and practices based on lifecycle analysis and long-term sustainability considerations. |
| **3. Understand the principles of waste management and energy efficiency in civil engineering projects.** | 3.1 Demonstrates a clear understanding of waste management principles in the context of civil engineering projects. |

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| | 3.2 Identifies various types of waste generated during construction and their environmental impacts.<br>3.3 Applies energy-efficient practices and technologies to minimise energy consumption during construction and operation.<br>3.4 Evaluates the effectiveness of different waste management strategies in reducing landfill use and promoting recycling.<br>3.5 Considers the long-term sustainability of waste management practices and energy efficiency measures.<br>3.6 Integrates relevant legal and regulatory requirements into waste management and energy efficiency strategies. |

**CE0003 -8: Project Management in Civil Engineering**

This study unit aims to provide learners with the knowledge and skills required to effectively manage civil engineering projects. It focuses on developing competencies in planning, organizing, and overseeing projects, with an emphasis on budgeting, scheduling, and resource allocation. Learners will gain practical experience in applying project management tools and techniques to ensure cost efficiency, adherence to timelines, and maintenance of quality standards.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Plan, organize, and manage civil engineering projects, including budgeting, scheduling, and resource allocation.** | 1.1. Demonstrates proficiency in the development of project plans, including scope, objectives, and deliverables.<br>1.2. Effectively allocates resources, including manpower, equipment, and materials, to ensure project efficiency.<br>1.3. Develops accurate budgets and financial forecasts, ensuring cost control and minimising project overruns.<br>1.4. Creates and manages project schedules, identifying critical paths and addressing potential delays proactively.<br>1.5. Utilises project management software and tools to monitor progress and adjust plans as necessary.<br>1.6. Ensures project compliance with legal, safety, and quality standards while maintaining efficient execution. |
| **2. Apply project management tools and techniques to control costs, timelines, and quality.** | 2.1 Utilises project management software to track costs, timelines, and quality metrics effectively.<br>2.2 Applies cost-control techniques to monitor and mitigate project budget deviations.<br>2.3 Implements scheduling tools to optimise resource allocation and ensure timely project delivery.<br>2.4 Integrates quality management processes to ensure deliverables meet required standards and specifications.<br>2.5 Identifies potential risks to project timelines and costs, applying mitigation strategies as necessary.<br>2.6 Continuously monitors project progress, adjusting strategies to maintain alignment with project goals and objectives. |
| **3. Understand the roles and responsibilities of project managers in large-scale civil engineering projects.** | 3.1 Demonstrates a clear understanding of the overall responsibilities of project managers in large-scale civil engineering projects. |

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| | 3.2 Identifies key stakeholders and effectively manages relationships with clients, contractors, and other team members.<br>3.3 Oversees project planning, ensuring alignment with scope, budget, and timeline expectations.<br>3.4 Ensures compliance with legal, safety, and environmental regulations throughout the project lifecycle.<br>3.5 Develops risk management strategies and ensures timely mitigation of potential issues.<br>3.6 Provides leadership and direction to project teams, ensuring successful collaboration and effective decision-making. |

**CE0003 -9: Construction Safety and Risk Management**

The aim of this study unit is to develop learners' ability to identify, evaluate, and manage safety risks in construction environments. Through an understanding of industry safety standards, risk assessment processes, and the implementation of health and safety management systems, learners will be equipped to foster safe and compliant workplaces, minimizing hazards and ensuring the well-being of personnel on construction sites.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Recognize safety hazards in construction environments and apply safety regulations and protocols.** | 1.1. Identifies common safety hazards present in construction environments, including physical, chemical, and environmental risks.<br>1.2. Demonstrates a comprehensive understanding of relevant safety regulations and protocols in the construction industry.<br>1.3. Assesses risk factors associated with specific construction tasks and environments, recommending appropriate control measures.<br>1.4. Implements safety procedures to protect workers, visitors, and the general public from potential hazards.<br>1.5. Monitors compliance with health and safety regulations and addresses non-compliance issues promptly.<br>1.6. Promotes a culture of safety on construction sites through effective training and awareness programmes. |
| **2. Conduct risk assessments to identify and mitigate potential dangers on construction sites.** | 2.1 Identifies potential risks on construction sites, including physical, operational, and environmental hazards.<br>2.2 Utilises risk assessment methodologies to evaluate the likelihood and impact of identified dangers.<br>2.3 Proposes and implements effective mitigation strategies to reduce or eliminate risks to health and safety.<br>2.4 Integrates relevant health and safety regulations and industry standards into risk assessment processes.<br>2.5 Continuously monitors and updates risk assessments in response to changes in site conditions or project scope.<br>2.6 Communicates risk assessment findings clearly to stakeholders and ensures all personnel are trained on safety protocols. |
| **3. Understand the importance of health and safety management systems in maintaining a safe** | 3.1 Demonstrates a clear understanding of the role of health and safety management systems |

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| **working environment.** | in preventing workplace accidents.<br>3.2 Identifies key components of effective health and safety management systems, including policies, procedures, and documentation.<br>3.3 Applies health and safety regulations and standards to create and maintain a safe working environment.<br>3.4 Evaluates the effectiveness of existing health and safety systems and recommends improvements where necessary.<br>3.5 Promotes continuous monitoring and review of health and safety practices to ensure compliance and effectiveness.<br>3.6 Engages workers and stakeholders in safety initiatives, fostering a culture of health and safety awareness on site. |

**CE0003 -10: Hydraulics and Water Engineering**

The aim of this study unit is to equip learners with the knowledge and skills required to apply fluid mechanics principles in the design and management of water systems. This includes the ability to analyse and solve real-world problems related to water supply, drainage systems, flood control, and water treatment. Students will develop the technical competence necessary to evaluate the behaviour of fluids in various engineering contexts, and design effective, sustainable water infrastructure solutions.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Apply principles of fluid mechanics to design water supply and drainage systems.** | 1.1. Demonstrates a solid understanding of the fundamental principles of fluid mechanics and their application to water supply and drainage systems.<br>1.2. Applies fluid flow equations and hydraulic principles to design efficient and effective water supply and drainage systems.<br>1.3. Assesses system requirements, including flow rates, pressure, and capacity, to ensure optimal design solutions.<br>1.4. Utilises appropriate materials and construction methods to meet design specifications for water distribution and drainage systems.<br>1.5. Considers the impact of environmental factors, such as terrain and climate, in the design of water supply and drainage systems.<br>1.6. Ensures compliance with relevant standards, regulations, and best practices in water supply and drainage system design. |
| **2. Analyse the behaviour of fluids in engineering contexts, including flow rates and pressure.** | 2.1 Demonstrate an understanding of fluid properties and their effect on fluid dynamics in engineering applications.<br>2.2 Accurately calculate and analyse flow rates in various fluid systems using appropriate formulas and methodologies.<br>2.3 Apply principles of fluid mechanics to assess pressure distribution within fluid systems.<br>2.4 Evaluate the impact of different fluid flow regimes (laminar and turbulent) on system performance.<br>2.5 Use appropriate software tools and techniques to simulate fluid flow and pressure scenarios.<br>2.6 Interpret experimental data to validate theoretical fluid behaviour models and adjust designs accordingly. |
| **3. Design and evaluate flood control measures and** | 3.1 Assess the specific environmental and |

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| **water treatment systems** | geographical factors influencing flood risks and water treatment needs.<br>3.2 Design effective flood control systems by applying principles of hydrology and civil engineering.<br>3.3 Evaluate the efficiency and sustainability of proposed flood control measures through modelling and simulations.<br>3.4 Develop water treatment systems by selecting suitable technologies based on water quality standards and regional requirements.<br>3.5 Integrate environmental and regulatory considerations into the design of flood control and water treatment systems.<br>3.6 Perform cost-benefit analysis to ensure the financial viability and long-term sustainability of the proposed systems. |

**CE0003 -11: Transportation Engineering and Planning**

The aim of this study unit is to equip learners with a comprehensive understanding of the principles and methodologies involved in designing and planning transportation systems. The unit focuses on developing the skills necessary to analyse traffic flow, enhance transportation efficiency and safety, and assess the environmental and social implications of transportation infrastructure projects. This foundation enables learners to contribute effectively to sustainable and community-focused transportation development initiatives.

| Learning Outcome: | Assessment Criteria: |
|---|---|
| **1. Understand the principles of designing and planning transportation infrastructure such as roads, railways, and airports.** | 1.1. Demonstrate an understanding of the fundamental principles of transportation infrastructure design, including road, railway, and airport systems.<br>1.2. Apply knowledge of engineering design standards and regulations to transportation infrastructure planning.<br>1.3. Evaluate the suitability of various materials and construction methods for transportation projects.<br>1.4. Assess the impact of environmental, social, and economic factors on transportation infrastructure planning.<br>1.5. Integrate safety considerations and accessibility standards into the design process of transportation systems.<br>1.6. Utilise advanced planning tools and techniques to model and optimise transportation infrastructure designs. |
| **2. Analyse traffic flow and apply transportation planning concepts to improve efficiency and safety.** | 2.1 Apply traffic flow theories to assess and model the movement of vehicles in various transportation networks.<br>2.2 Analyse traffic patterns and identify potential bottlenecks or congestion points within transportation systems.<br>2.3 Evaluate the impact of different traffic management strategies on flow efficiency and safety.<br>2.4 Use transportation planning concepts to propose improvements to road networks, including signage, lane usage, and traffic signals.<br>2.5 Assess the effectiveness of safety measures, such as speed limits, pedestrian crossings, and traffic calming devices.<br>2.6 Utilise simulation tools and data analysis to predict the outcomes of proposed traffic flow improvements. |

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| **3. Evaluate the environmental and social impacts of transportation projects on communities and ecosystems.** | 3.1 Analyse the potential environmental impacts of transportation projects, including air quality, noise pollution, and habitat disruption.<br>3.2 Assess the social implications of transportation projects on local communities, including displacement, accessibility, and public health.<br>3.3 Evaluate the sustainability of transportation infrastructure in terms of long-term environmental and social effects.<br>3.4 Investigate the effectiveness of mitigation strategies for reducing negative environmental and social impacts.<br>3.5 Review the role of stakeholder engagement in addressing community concerns and ensuring project transparency.<br>3.6 Apply relevant environmental regulations and social impact assessment frameworks to evaluate transportation projects. |

**CE0003 -12: Civil Engineering Design Project**

The aim of this study unit is to provide learners with the opportunity to synthesize and apply interdisciplinary knowledge from various domains of civil engineering to design and execute a practical project. It focuses on fostering analytical and creative problem-solving skills, project management proficiency, and the ability to effectively communicate design processes and solutions, preparing students for real-world engineering challenges.

| Learning Outcome: | Assessment Criteria: |
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| **1. Integrate knowledge from various areas of civil engineering to design a practical civil engineering project.** | 1.1. Demonstrate the ability to combine principles from structural, geotechnical, transportation, and environmental engineering to design a cohesive civil engineering project.<br>1.2. Analyse project requirements, including functionality, safety, cost, and environmental impact, and integrate these factors into the design process.<br>1.3. Apply engineering design standards, codes, and regulations to ensure the feasibility and safety of the project.<br>1.4. Use advanced modelling and simulation tools to evaluate the performance and efficiency of the proposed design.<br>1.5. Incorporate risk management strategies to address potential challenges and uncertainties in the project design.<br>1.6. Collaborate with multidisciplinary teams to refine and optimise the project design, ensuring all engineering aspects are aligned with the project goals. |
| **2. Apply engineering analysis, design principles, and project management techniques to develop a comprehensive project plan.** | 2.1 Demonstrate the ability to apply engineering analysis techniques to assess project requirements and constraints.<br>2.2 Utilise design principles to create a detailed and feasible project plan, ensuring alignment with technical specifications and standards.<br>2.3 Incorporate project management methodologies to establish timelines, resource allocation, and cost estimations for the project.<br>2.4 Apply risk management strategies to identify potential project risks and develop mitigation plans.<br>2.5 Use project scheduling tools to develop a comprehensive timeline, incorporating milestones, deliverables, and critical paths.<br>2.6 Continuously evaluate project progress and adjust the plan as necessary to meet |

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| | objectives, ensuring quality and efficiency. |
| **3. Present and communicate the design process, including solutions to challenges encountered during the project.** | 3.1 Clearly articulate the design process, outlining the steps taken from initial concept through to final solution.<br>3.2 Present design solutions in a structured format, addressing technical, financial, and practical considerations.<br>3.3 Communicate effectively with stakeholders, providing clear explanations of decisions, challenges, and outcomes.<br>3.4 Document and present any challenges encountered during the project, including technical, environmental, or resource-related issues.<br>3.5 Provide detailed explanations of the strategies and solutions implemented to overcome project challenges.<br>3.6 Use visual aids such as diagrams, charts, and presentations to enhance understanding and engagement with the design process. |

# ICTQual AB

Yew Tree Avenue, Dagenham,

London East,United Kingdom RM10 7FN

+44 744 139 8083

Support@ictqualab.co.uk | www.ictqualab.co.uk

**Visit Official Web page**