****

**REPUBLIC OF KENYA**

**COMPETENCY BASED CURRICULUM**

**FOR**

**QUANTITY SURVEYING**

**LEVEL 6**



TVET CDACC

P.O. BOX 15745-00100

NAIROBI

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# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training (Sectional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this curriculum has been developed.

It is my conviction that this curriculum will play a great role towards development of competent human resource for the building and construction sector.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

#  PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 and Sectional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) in conjunction with Quantity Surveying Sector Skills Advisory Committee (SSAC) have developed this curriculum.

This curriculum is designed and organized with an outline of learning outcomes; suggested delivery methods, training/learning resources and methods of assessing the trainee’s achievement. The curriculum is competency-based and allows multiple entry and exit to the course.

 I am grateful to the Council members, Council Secretariat, Quantity Surveying SSAC, expert workers and all those who participated in the development of this curriculum.

**Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), Con. EngTech.**

**CHAIRMAN, TVET CDACC**

# ACKNOWLEDGEMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support was received from various organizations.

I recognize with appreciation the role of Quantity Surveying Sector Skills Advisory Committee (SSAC) members for their contribution to the development of this curriculum.

I also thank all stakeholders in the Quantity Surveying sector for their valuable input and all those who participated in the process of developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that workers in building and construction acquire competencies that will enable them to perform their work more efficiently.

**Dr. LAWRENCE GUANTAI M’ITONGA, PhD**

**COUNCIL SECRETARY/CEO**

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# ACRONYMS

|  |  |
| --- | --- |
| CDACC  | Curriculum Development Assessment and Certification Council |
| PPE | Personal Protective Equipment |
| BQS | Bill of Quantities |
| CAD | Computer Aided Design |
| EHS | Environment, health and safety |
| EMS | Environmental Management System  |
| ICT | Information Computer Technology |
| NEMA | National Environment Management Authority |
| NOS | National Occupational Standards |
| TVET | Technical and vocational education and training |
| BRC | British reinforcement concrete |

# KEY TO UNIT CODE

 **ENG / CU /QS/BC/01/6/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

# COURSE OVERVIEW

1. **Brief description of the course:**

The present curriculum presents a coherent and significant set of competences to acquire in order to perform the occupation of a **Quantity Surveying** level 6. The competency-based approach, used to design the curriculum, is industry driven and has considered the training needs, the work situation, as well as the goals and the means to implement training units of competencies.

The units of competencies, within the present curriculum, include a statement, description and a set of expected outcomes and results at the end of the training of each unit. It also clearly mentioned the training contents, the methods of training delivery, the methods of assessment, a list of main materials/tools/equipment needed and a list of recommended resources for each of the units.

The description of elements, methods of delivery and assessment and the lists of materials/tools and equipment will have a direct influence on the choice of the theoretical and/or practical learning activities and their respective timing. The competences are the targets of training: the acquisition of each is required for certification.

The present curriculum consists of 19 units of competency divided in three main lots:

* **Basic Units of Learning:** (also known as employability skills or key skills) skills which are not specific to work in a specific occupation or industry, but are important for work, education and life generally, as per the list in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit of Learning Code** | **Unit of Learning Title** | **Duration in Hours** | **Credit Factor** |
| ENG/CU/QS/BC/01/6/A | Communication skills  | 40 | 4 |
| ENG/CU/QS/BC/02/6/A | Digital literacy | 60 | 6 |
| ENG/CU/QS/BC/03/6/A | Entrepreneurial skills | 100 | 10 |
| ENG/CU/QS/BC/04/6/A | Employability skills | 80 | 8 |
| ENG/CU/QS/BC/05/6/A | Environmental literacy | 40 | 4 |
| ENG/CU/QS/BC/06/6/A | Occupational safety and health practices | 40 | 4 |
| **Total** | **360** | **36** |

**Common Units of Learning**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit of learning** | **Unit of learning title** | **Duration in Hours** | **Credit Factor** |
| ENG/CU/QS/CC/01/6/A | Engineering Mathematics | 150 | 15 |
| ENG/CU/QS/CC/02/6/A | Building Temporary Works | 190 | 19 |
| ENG/CU/QS/CC/03/6/A | Technical Drawing | 60 | 6 |
| ENG/CU/QS/CC/04/6/A | Building Materials Science | 88 | 9 |
| ENG/CU/QS/CC/05/6/A | Workshop Technology Practices | 132 | 13 |
| **Total**  | **620** | **62** |

**Core Units of Learning:** describe the skills, knowledge and attitudes within a competency standard that an industry sector has agreed are essential to be achieved if a person is to be accepted as competent at a particular level. Core competency units are normally those central to work in a particular industry as per the list in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit of Learning Code** | **Unit of Learning Title** | **Duration in Hours** | **Credit Factor** |
| ENG/CU/QS/CR/01/6/A | Engineering Survey | 336 | 33.5 |
| ENG/CU/QS/CR/02/6/A | Building Drawings | 168 | 17 |
| ENG/CU/QS/CR/03/6/A | Civil Engineering drawings | 168 | 17 |
| ENG/CU/QS/CR/04/6/A | Construction Works | 336 | 33.5 |
| ENG/CU/QS/CR/05/6/A | Bills of Quantities | 672 | 67 |
| ENG/CU/QS/CR/06/6/A | Project Contracts Management | 168 | 17 |
| ENG/CU/QS/CR/07/6/A | Construction Project Finance Management | 168 | 17 |
| ENG/CU/QS/CR/08/6/A | Construction Project Management | 168 | 17 |
|  | Industrial Attachment | 480 | 48 |
| **Total** | **2664** | **267** |
| **Grand Total** | **3644** | **365** |

1. **Entry Requirements**

An individual entering this course should have any of the following minimum requirements:

1. Post graduate qualification certificate in **Civil Engineering**

 **Or**

1. Degree qualification certificate in **Civil Engineering**

Or

1. Certificate/diploma/higher diploma (KNEC) in Building Technology or related construction course

**Or**

1. Kenya Certificate of Secondary Education (KCSE grade C-)

**Or**

1. Equivalent qualifications as determined by Kenya National Qualifications Authority (KNQA)
2. **Provision for Industrial attachment**

It is envisaged that the trainee will undergo an industrial attachment training and assessment with a recognised construction services provider as a prerequisite for completion of this training course.

1. **Attachment/Internship:**

Attachment (Internship) is an opportunity for a learner to integrate career related experience by participating in planned, supervised work. This curriculum anticipates at least 480 hours of attachment as integral part of the training. In addition, the training comprises practical learning activities (estimated to be >60% of the time) which are meant to reinforce trainees’ smooth access to employment or self-employment.

1. **Assessment**

Assessment is the process of gathering and judging evidence in order to decide whether a person has attained a standard of performance. The course will be assessed at two levels:

* Internal assessment is continuous and is conducted by the trainer who is monitored by an internal accredited verifier
* External assessment is the responsibility of TVET CDACC
1. **Certification**

On successful completion of a unit of learning, a trainee will be issued with a Certificate of acknowledging achievement of the competence and on successful completion of all units of learning a trainee will be awarded a National Certified Quantity Surveyor qualification. These certificates will be issued by TVET CDACC in conjunction with training provider

# BASIC UNITS OF LEARNING

# COMMUNICATION SKILLS

**UNIT CODE:**  ENG/CU/QS/BC/01/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Demonstrate communication skills

**Duration of Unit:** 40 hours

**Unit Description**

This unit covers the competencies required in meeting communication needs of clients and colleagues and developing, establishing, maintaining communication pathways and strategies. It also covers competencies for conducting interview, facilitating group discussion and representing the organization in various forums.

**Summary of Learning Outcomes**

1. Meet communication needs of clients and colleagues
2. Develop communication strategies
3. Establish and maintain communication pathways
4. Promote use of communication strategies
5. Conduct interview
6. Facilitate group discussion
7. Represent the organization

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Meet communication needs of clients and colleagues
 | * Communication process
* Modes of communication
* Medium of communication
* Effective communication
* Barriers to communication
* Flow of communication
* Sources of information
* Organizational policies
* Organization requirements for written and electronic communication methods
* Report writing
* Effective questioning techniques (clarifying and probing)
* Workplace etiquette
* Ethical work practices in handling communication
* Active listening
* Feedback
* Interpretation
* Flexibility in communication
* Types of communication strategies
* Elements of communication strategy
 | * Interview
* Written
 |
| 1. Develop communication strategies
 | * Dynamics of groups
* Styles of group leadership
* Openness and flexibility in communication
* Communication skills relevant to client groups
 | * Interview
* Written
 |
| 1. Establish and maintain communication pathways
 | * Types of communication pathways
 | * Interview
* Written
 |
| 1. Promote use of communication strategies
 | * Application of elements of communication strategies
* Effective communication techniques
 | * Interview
* Written
 |
| 1. Conduct interview
 | * Types of interview
* Establishing rapport
* Facilitating resolution of issues
* Developing action plans
 | * Interview
* Written
 |
| 1. Facilitate group discussion
 | * Identification of communication needs
* Dynamics of groups
* Styles of group leadership
* Presentation of information
* Encouraging group members participation
* Evaluating group communication strategies
 | * Interview
* Written
 |
| 1. Represent the organization
 | * Presentation techniques
* Development of a presentation
* Multi-media utilization in presentation
* Communication skills relevant to client groups
 | * Interview
* Written
 |

**Suggested Delivery Methods**

* Discussion
* Role playing
* Simulation
* Direct instruction
* Practice by trainee

**Recommended Resources**

* Desktop computers/laptops
* Internet connection
* Projectors
* Telephone

# DIGITAL LITERACY

**UNIT CODE:** ENG/CU/QS/BC/02/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate digital literacy

**Duration of Unit:** 60 hours

**Unit Description**

This unit describes competencies required to use a computer and other digital devices for the purposes of communication, work performance and management at the workplace.

**Summary of Learning Outcomes**

1. Identify computer software and hardware
2. Apply security measures to data, hardware, software in automated environment
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace
5. Apply desktop publishing in official assignments
6. Prepare presentation packages

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify computer hardware and software
 | * Concepts of ICT
* Functions of ICT
* History of computers
* Components of a computer
* Classification of computers
 | * Written tests
* Oral presentation
* Observation
 |
| 1. Apply security measures to data, hardware and software
 | * Data security and control
* Security threats and control measures
* Types of computer crimes
* Detection and protection against computer crimes
* Laws governing protection of ICT
 | * Written tests
* Oral presentation
* Observation
* Project
 |
| 1. Apply computer software in solving tasks
 | * Operating system
* Word processing
* Spread sheets
* Data base design and manipulation
* Data manipulation, storage and retrieval
 | * Oral questioning
* Observation
* Project
 |
| 1. Apply internet and email in communication at workplace
 | * Computer networks
* Network configurations
* Uses of internet
* Electronic mail (e-mail) concept
 | * Oral questioning
* Observation
* Oral presentation
* Written report
 |
| 1. Apply desktop publishing in official assignments
 | * Concept of desktop publishing
* Opening publication window
* Identifying different tools and tool bars
* Determining page layout
* Opening, saving and closing files
* Drawing various shapes using DTP
* Using colour pellets to enhance a document
* Inserting text frames
* Importing and exporting text
* Object linking and embedding
* Designing of various publications
* Printing of various publications
 | * Oral questioning
* Observation
* Oral presentation
* Written report
* Project
 |
| 1. Prepare presentation packages
 | * Types of presentation packages
* Procedure of creating slides
* Formatting slides
* Presentation of slides
* Procedure for editing objects
 | * Oral questioning
* Observation
* Oral presentation
* Written report
* Project
 |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos
* Project
* Group discussions

**Recommended Resources**

* Desk top computers
* Laptop computers
* Other digital devices
* Printers
* Storage devices
* Internet access
* Computer software

# ENTREPRENEURSHIP EDUCATION

**UNIT CODE:** ENG/CU/QS/BC/03/6/A

**Relationship to occupational standards**

This unit addresses the unit of competency: Demonstrate entrepreneurial skills

**Duration of unit:** 100 hours

**Unit description**

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship and self-employment. It also involves identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation and developing business innovative strategies.

**Summary of Learning Outcomes**

* 1. Demonstrate understanding of who an entrepreneur
	2. Demonstrate knowledge of entrepreneurship and self-employment
	3. Identify entrepreneurship opportunities
	4. Create entrepreneurial awareness
	5. Apply entrepreneurial motivation
	6. Develop business innovative strategies
	7. Develop Business plan

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Demonstrate knowledge of entrepreneurship and self-employment
 | * Importance of self-employment
* Requirements for entry into self-employment
* Role of an Entrepreneur in business
* Contributions of Entrepreneurs to National development
* Entrepreneurship culture in Kenya
* Born or made entrepreneurs
 | * Observation
* Case studies
* Individual/group assignments
* Projects
* Written tests

Oral questionsThird party reportInterviews |
| 1. Identify entrepreneurship opportunities
 | * Business ideas and opportunities
* Sources of business ideas
* Business life cycle
* Legal aspects of business
* Assessment of product demand
* Business environment
* Factors to consider when evaluating business environment
* Technology in business
 | * Observation
* Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Create entrepreneurial awareness
 | * Forms of businesses
* Sources of business finance
* Factors in selecting source of business finance
* Governing policies on Small Scale Enterprises (SSEs)
* Problems of starting and operating SSEs
 | * Observation
* Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Apply entrepreneurial motivation
 | * Internal and external motivation
* Motivational theories
* Self-assessment
* Entrepreneurial orientation
* Effective communications in entrepreneurship
* Principles of communication
* Entrepreneurial motivation
 | * Observation
* Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Develop business innovative strategies
 | * Innovation in business
* Small business Strategic Plan
* Creativity in business development
* Linkages with other entrepreneurs
* ICT in business growth and development
 | * Observation
* Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |
| 1. Develop Business Plan
 | * Business description
* Marketing plan
* Organizational/Management
* plan
* Production/operation plan
* Financial plan
* Executive summary
* Presentation of Business Plan
 | * Observation
* Case studies
* Individual/group assignments
* Projects
* Written tests
* Oral questions
* Third party report
* Interviews
 |

**Suggested Methods of instruction:**

* Direct instruction
* Project
* Case studies
* Field trips
* Discussions
* Demonstration
* Question and answer
* Problem solving
* Experiential
* Internship
* Team training
* Guest speakers

**Recommended Resources**

* Case studies
* Business plan templates
* Computers
* Overhead projectors
* Internet
* Mobile phone
* Video clips
* Films
* Newspapers and Handouts
* Business Journals
* Writing materials

# EMPLOYABILITY SKILLS

**UNIT CODE:** ENG/CU/QS/BC/04/6/A

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate employability skills

**Duration of Unit:** 80 hours

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

**Summary of Learning Outcomes**

1. Conduct self-management
2. Demonstrate interpersonal communication
3. Demonstrate critical safe work habits
4. Lead a workplace team
5. Plan and organize work
6. Maintain professional growth and development
7. Demonstrate workplace learning
8. Demonstrate problem solving skills
9. Manage ethical performance

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct self-management
 | * Self-awareness
* Formulating personal vision, mission and goals
* Strategies for overcoming life challenges
* Managing emotions
* Emotional intelligence
* Assertiveness versus aggressiveness
* Expressing personal thoughts, feelings and beliefs
* Developing and maintaining high self-esteem
* Developing and maintaining positive self-image
* Setting performance targets
* Monitoring and evaluating performance
* Articulating ideas and aspirations
* Accountability and responsibility
* Good work habits
* Self-awareness
* Values and beliefs
* Self-development
* Financial literacy
* Healthy lifestyle practices
* Adopting safety practices
 | * Observation
* Written
* Oral interview
* Third party report
 |
| 1. Demonstrate interpersonal communication
 | * Meaning of interpersonal communication
* Listening skills
* Types of audience
* Public speaking
* Writing skills
* Negotiation skills
* Reading skills
* Meaning of empathy
* Understanding customers’ needs
* Establishing communication networks
* Assertiveness
* Sharing information
 | * Observation
* Written
* Oral interview
* Third party report
 |
| 1. Demonstrate critical safe work habits
 | * Stress and stress management
* Time concept
* Punctuality and time consciousness
* Leisure
* Integratingpersonal objectives into organizational objectives
* Resources mobilization
* Resources utilization
* Setting work priorities
* Developing healthy relationships
* HIV and AIDS
* Drug and substance abuse
* Managing emerging issues
 | * Observation
* Written
* Oral interview
* Third party report
 |
| 1. Lead a workplace team
 | * Leadership qualities
* Power and authority
* Team building
* Determination of team roles and objectives
* Team parameters and relationships
* Individual responsibilities in a team
* Forms of communication
* Complementing team activities
* Gender and gender mainstreaming
* Human rights
* Developing healthy relationships
* Maintaining relationships
* Conflicts and conflict resolution
* Coaching and mentoring skills
 | * Observation
* Oral interview
* Written
* Third party report
 |
| 1. Plan and organize work
 | * Functions of management
* Planning
* Organizing
* Time management
* Decision making concept
* Task allocation
* Developing work plans
* Developing work goals/objectives and deliverables
* Monitoring work activities
* Evaluating work activities
* Resource mobilization
* Resource allocation
* Resource utilization
* Proactive planning
* Risk evaluation
* Problem solving
* Collecting, analysing and organising information
* Negotiation
 | * Observation
* Oral interview
* Written
* Third party report
 |
| 1. Maintain professional growth and development
 | * Avenues for professional growth
* Training and career opportunities
* Assessing training needs
* Mobilizing training resources
* Licenses and certifications for professional growth and development
* Pursuing personal and organizational goals
* Managing work priorities and commitments
* Recognizing career advancement
 | * Observation
* Oral interview
* Written
* Third party report
 |
| 1. Demonstrate workplace learning
 | * Managing own learning
* Mentoring
* Coaching
* Contributing to the learning community at the workplace
* Cultural aspects of work
* Networking
* Variety of learning context
* Application of learning
* Safe use of technology
* Taking initiative/proactivity
* Flexibility
* Identifying opportunities
* Generating new ideas
* Workplace innovation
* Performance improvement
* Managing emerging issues
* Future trends and concerns in learning
 | * Observation
* Oral interview
* Written
* Third party report
 |
| 1. Demonstrate problem solving skills
 | * Critical thinking process
* Data analysis tools
* Decision making
* Creative thinking
* Development of creative, innovative and practical solutions
* Independence in identifying and solving problems
* Solving problems in teams
* Application of problem-solving strategies
* Testing assumptions
* Resolving customer concerns
 | * Observation
* Oral interview
* Written
* Third party report
 |
| 1. Manage ethical performance
 | * Meaning of ethics
* Ethical perspectives
* Principles of ethics
* Ethical standards
* Organization code of ethics
* Common ethical dilemmas
* Organization culture
* Corruption, bribery and conflict of interest
* Privacy and data protection
* Diversity, harassment and mutual respect
* Financial responsibility/accountability
* Etiquette
* Personal and professional integrity
* Commitment to jurisdictional laws
* Emerging issues in ethics
 | * Observation
* Oral interview
* Written
* Third party report
 |

**Suggested Methods of Delivery**

* Instructor lead facilitation of theory
* Demonstrations
* Simulation/Role play
* Group Discussion
* Presentations
* Projects
* Case studies
* Assignments

**Recommended Resources**

* Computers
* Stationery
* Charts
* Video clips
* Audio tapes
* Radio sets
* TV sets
* LCD projectors

# ENVIRONMENTAL LITERACY

**UNIT CODE**: ENG/CU/QS/BC/05/6/A

**Relationship to Occupational Standards**:

This unit addresses the unit standard: Demonstrate environmental literacy

**Duration of Unit:** 40 hours

**Unit Description**

This unit describes the competencies required to control environmental hazard, control environmental pollution, comply with workplace sustainable resource use, evaluate current practices in relation to resource usage, identify environmental legislations/conventions for environmental concerns, implement specific environmental programs, monitor activities on environmental protection/programs, analyze resource use and develop resource conservation plans.

**Summary of Learning Outcomes**

1. Control environmental hazard
2. Control environmental Pollution
3. Demonstrate sustainable resource use
4. Evaluate current practices in relation to resource usage
5. Identify Environmental legislations/conventions for environmental concerns
6. Implement specific environmental programs
7. Monitor activities on Environmental protection/Programs
8. Analyze resource use
9. Develop resource conservation plans

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** |  **Content** | **Suggested Assessment Methods** |
| 1. Control environmental hazard
 | * Purposes and content of Environmental Management and Coordination Act 1999
* Storage methods for environmentally hazardous materials
* Disposal methods of hazardous wastes
* Types and uses of PPE in line with environmental regulations
* Occupational Safety and Health Standards (OSHS)
 | * Written questions
* Oral questions
* Observation of work procedures
 |
| 1. Control environmental Pollution control
 | * Types of pollution
* Environmental pollution control measures
* Types of solid wastes
* Procedures for solid waste management
* Different types of noise pollution
* Methods for minimizing noise pollution
 | * Written questions
* Oral questions
* Observation of work procedures
* Role play
 |
| 1. Demonstrate sustainable resource use
 | * Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Methods for minimizing wastage
* Waste management procedures
* Principles of 3Rs (Reduce, Reuse, Recycle)
* Methods for economizing or reducing resource consumption
 | * Written questions
* Oral questions
* Observation of work procedures
* Role play
 |
| 1. Evaluate current practices in relation to resource usage
 | * Collection of information on environmental and resource efficiency systems and procedures,
* Measurement and recording of current resource usage
* Analysis and recording of current purchasing strategies.
* Analysis of current work processes to access information and data
* Identification of areas for improvement
 | * Written questions
* Oral questions
* Observation of work procedures
* Role play
 |
| 1. Identify Environmental legislations/conventions for environmental concerns
 | * Environmental issues/concerns
* Environmental legislations /conventions and local ordinances
* Industrial standard /environmental practices
* International Environmental Protocols (Montreal, Kyoto)
* Features of an environmental strategy
 | * Written questions
* Oral questions
* Observation of work procedures
 |
| 1. Implement specific environmental programs
 | * Community needs and expectations
* Resource availability
* 5s of good housekeeping
* Identification of programs/Activities
* Setting of individual roles/responsibilities
* Resolving problems /constraints encountered
* Consultation with stakeholders
 | * Written questions
* Oral questions
* Observation of work procedures
* Role play
 |
| 1. Monitor activities on Environmental protection/Programs
 | * Periodic monitoring and Evaluation of activities
* Gathering feedback from stakeholders
* Analyzing data gathered
* Documentation of recommendations and submission
* Setting of management support systems to sustain and enhance the program
* Monitoring and reporting of environmental incidents to concerned /proper authorities
 | * Oral questions
* Written tests
* Practical test
* Observation
 |
| 1. Analyze resource use
 | * Identification of resource consuming processes
* Determination of quantity and nature of resource consumed
* Analysis of resource flow through different parts of the process.
* Classification of wastes for possible source of resources.
 | * Written tests
* Oral questions
* Practical test
* Observation
 |
| 1. Develop resource Conservation plans
 | * Determination of efficiency of use/conversion of resources
* Causes of low efficiency of use of resources
* Plans for increasing the efficiency of resource use
 | * Written tests
* Oral questions
* Practical test
* Observation
 |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Practical demonstration of tasks by trainer
* Practice by trainees
* Observations and comments and corrections by trainers

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Environmental Management and Coordination Act 1999
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE)
* ISO standards
* Company environmental management systems (EMS)
* Montreal Protocol
* Kyoto Protocol

# OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** ENG/CU/QS/BC/06/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Demonstrate occupational safety and health practices

**Duration of Unit:** 40 hours

**Unit Description**

This unit describes the competencies required to comply with regulatory and organizational requirements for occupational safety and health.

**Summary of Learning Outcomes**

1. Identify workplace hazards and risk
2. Identify and implement appropriate control measures to hazards and risks
3. Implement OSH programs, procedures and policies/guidelines

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify workplace hazards and risks
 | * Identification of hazards in the workplace and/or the indicators of their presence
* Evaluation and/or work environment measurements of OSH hazards/risk existing in the workplace
* Gathering of OSH issues and/or concerns
 | * Oral questions
* Written tests
* Observation of trainees identify hazards and risks
 |
| 1. Identify and implement appropriate control measure to hazards and risks
 | * Prevention and control measures e.g. use of PPE
* Contingency measures
 | * Oral questions
* Written tests
* Practical tests
* Observation of implementation of control measures
 |
| 1. Implement OSH

 programs, procedures and policies/guidelines | * Company OSH program, procedures and policies/guidelines
* Implementation of OSH procedures and policies/ guidelines
* Training of team members and advice on OSH standards and procedures
* Implementation of procedures for maintaining OSH-related records
 | * Oral questions
* Written tests
* Practical test
* Observation
 |

**Suggested Delivery Methods**

* Instructor led facilitation of theory
* Demonstration by trainer
* Practical work by trainee
* Viewing of related videos

**Recommended Resources**

* Standard operating and/or other workplace procedures manuals
* Specific job procedures manuals
* Machine/equipment manufacturer’s specifications and instructions
* Personal Protective Equipment (PPE) e.g.
* Mask
* Face mask/shield
* Safety boots
* Safety harness
* Arm/Hand guard, gloves
* Eye protection (goggles, shield)
* Hearing protection (ear muffs, ear plugs)
* Hair Net/cap/bonnet
* Hard hat
* Face protection (mask, shield)
* Apron/Gown/coverall/jump suit
* Anti-static suits
* High-visibility reflective vest

# COMMON UNITS OF LEARNING

# ENGINEERING MATHEMATICS

**UNIT CODE:** ENG/CU/QS/CC/01/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: **Apply engineering mathematics**

**Duration of Unit:** 150 hours

**Unit Description**

This unit describes the competencies required by a technician in order to apply a wide range of mathematical skills in their work; apply ratios and proportions to solve problems; use algebraic and graphical techniques to analyse mathematical problems; apply concepts of probability; perform commercial calculations and collect, organise and analyse statistical data.

**Summary of Learning Outcomes**

1. Use concepts of arithmetic in solving work problems
2. Use common formula and algebraic expressions for work
3. Use trigonometry to solve practical engineering problems
4. Perform estimations, measurements and calculations
5. Apply matrices in work
6. Apply vectors in work
7. Collect, organize and interpret statistical data
8. Apply concepts of probability for work
9. Perform commercial calculations

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Use concepts of arithmetic in solving work problems
 | * Fundamental operations
* Addition, subtraction, multiplication and division of positive and negative numbers
* Fractions and decimals operations and conversions
* Indices
* Ratios and proportions
* Meaning
* Conversions into percentages
* Direct and inverse proportions determination
* Use of scientific calculator
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Use formulae and algebraic expressions for work
 | * + Algebraic linear equations
* Simultaneous
* Quadratic
	+ Linear graphs
* Plotting
* Interpretation
	+ Applications of linear graphs
* Curves of first and second degree
* Plotting
* Interpretation
* Applications
 | * Written tests
* Oral questioning
* Assignments
* Supervised exercises
 |
| 1. Use trigonometry to solve practical work problems
 | * Meaning of trigonometry
* Pythagoras theorem
* Trigonometry ratios of angles
* Trigonometric identities
* Conversion of angles
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests
 |
| 1. Perform estimations, measurements and calculations of quantities
 | * Units of measurements and their symbols
* Conversion of units of measurement
* Calculation of length, width, height, perimeter, area and angles of figures
* Measuring tools and equipment
* Performing measurements and estimations of quantities
 | * Assignments
* Oral questioning
* Practical tests
* Observation
* Supervised exercises
* Written tests
 |
| 1. Apply matrices in work
 | * + Meaning of matrix
	+ Types of matrices
	+ Matrix operations
* Compatibility
* Addition
* Subtraction
* Multiplication
	+ Determination of inverse of a matrix
	+ Solution of simultaneous equations with two and three unknowns
	+ Applications of matrices
 | * Assignments
* Supervised exercises
* Written tests
 |
| 1. Collect, organize and interpret statistical data
 | * + Classification of data
* Grouped data
* Ungrouped data
	+ Data collection
* Importance of sampling
* Errors in sampling
* Types of sampling and their limitations
	+ Tabulation of data
* Class intervals
* Class boundaries
* Frequency tables
* Cumulative frequency
	+ Diagrammatic and graphical presentation of data e.g.
* Histograms
* Frequency polygons
* Bar charts
* Pie charts
	+ Cumulative frequency curves
	+ Meaning of measures of central tendency
	+ Measures
* Properties
* Calculation and interpretation of mean, mode and median
	+ Variance and standard deviation
 | * Assignments
* Oral questioning
* Supervised exercises
* Written tests
 |
| 1. Apply vectors in work
 | * + Meaning of vector
	+ Representations of vectors
	+ Operations of vectors
* Addition
* Subtraction
* Scalar and vector products
	+ Determination of angles
 | * Assignments
* Supervised exercises
* Written tests
 |
| 1. Apply concepts of probability in work
 | * + Meaning of probability
	+ Types of probability events
* Dependent
* Independent
* Mutually exclusive
	+ Laws of probability
	+ Counting techniques
* Permutation
* Combination
* Tree diagrams
* Venn diagrams
 | * Written tests
* Assignments
* Supervised exercises
 |
| 1. Perform commercial calculations
 | * + Product pricing
	+ Average sales determination
	+ Stock turnover
	+ Calculation of incomes
	+ Profit and loss calculations
	+ Salaries
* Gross
* Net
	+ Wages
* Time rate
* Flat rate
* Overtime
* Piece rate
* Commission
* Percentage
* Bonus
	+ Conversion of one currency to another
	+ Exchange rates calculation
* Devaluation
* Revaluation
 | * Oral questioning
* Written tests
* Assignments
* Supervised exercises
 |

**Suggested Delivery Methods**

* Group discussions
* Demonstration by trainer
* Exercises by trainee

**Recommended Resources**

* Scientific Calculators
* Rulers, pencils, erasers
* Charts with presentations of data
* Graph books
* Dice
* Computers with internet connection

# BUILDING TEMPORARY WORKS

**UNIT CODE:** ENG/CU/QS/CC/02/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Perform building temporary works

**Duration of Unit:** 190 HOURS

**Unit Description**

This Unit describes the competencies required to perform building temporary works. It involves erecting and dismantling building scaffolds and building shores, constructing and dismantling building formwork/shuttering and trench timbering.

**Summary of Learning Outcomes**

1. Erect and dismantle building scaffolding
2. Construct and dismantle building form work/shuttering
3. Construct and dismantle trench timbering
4. Erect and dismantle building shores

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Construct and dismantle trench timbering
 | * Trench timbering materials and tools
* Soil mechanics
* Site investigation
* Trench timbering methods
* Trench layout design
* Trench timbering dismantling
 | * Project/practical assignment
* Written
* Oral
 |
| 1. Erect and dismantle building scaffolding
 | * Types of scaffolds
* Scaffold drawing
* Assembling and dismantling of scaffolds
* Personal protective equipment
* Site safety requirements
* Site clearance
 | * Project/practical assignment
* Written
* Oral
 |
| 1. Construct and dismantle building formwork/shuttering
 | * Structural elements
* Types of formwork
* Formwork materials
* Formwork measurements and dimensions
* Timber properties
* Formwork construction/installation
* Formwork dismantling
 | * Project/practical assignment
* Written
* Oral
 |
| 1. Erect and dismantle building shores
 | * Types of foundations
* Types of shores
* Shoring materials
* Shores connection methods
* Construction laws
* Local authority guidelines
* Shoring construction and erection
* Shoring dismantling
 | * Project/practical assignment
* Written
* Oral
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions

**Recommended Resources**

**Tools and equipment**

* Hammer
* Handsaw
* Shoring equipment
* Survey instruments
* Spanners
* Spirit level
* Plumb bob

**Materials and supplies**

* Field notebook
* Nails
* Bolts and nuts
* Timber poles
* Metal poles
* Metal plates
* Moulding oil

**Personal protective equipment (PPEs)**

* Overall
* Helmet
* Safety boots
* Masks
* Gloves
* First aid kit
* Reflectors
* Safety goggles

# TECHNICAL DRAWING

**UNIT CODE:** ENG/CU/QS/CC/03/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Prepare and interpret technical drawings

**Duration of Unit:** 60hours

**Unit Description**

This unit covers the competencies required to prepare and interpret technical drawings. It involves competencies to select, use and maintain drawing equipment and materials. It also involves producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings of components and application of Computer Aided Design (CAD) packages.

**Summary of Learning Outcomes**

1. Use and maintain drawing equipment and materials
2. Produce plane geometry drawings
3. Produce solid geometry drawings
4. Produce pictorial and orthographic drawings of components
5. Apply CAD packages

**Learning Outcomes, Content and Suggested Assessment Methods:**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Use and maintain drawing equipment and materials
 | * Identification and care of drawing equipment
* Identification and care of drawing materials
* Reference to manufacturer’s instructions and work place procedures on use and maintenance of drawing equipment and materials
* Reference to relevant environmental legislations
* Use of Personal Protective Equipment (PPEs)
 | * Observation
* Oral questioning
* Written tests
 |
| 1. Produce plane geometry drawings
 | * Types of lines in drawings
* Construction of geometric forms e.g. squares, circles
* Construction of different angles
* Measurement of different angles
* Bisection of different angles and lines
* Standard drawing conventions
 | * Oral questioning
* Practical tests
* Observation
 |
| 1. Produce solid geometry drawings
 | * Interpretation of sketches and drawings of patterns e.g. cylinders, prisms and pyramids
* Sectioning of solids e.g. prisms, cones
* Development and interpenetrations of solids e.g. cylinder to cylinder and cylinder to triangular, prism
 | * Observation
* Practical tests
* Oral questioning
 |
| 1. Produce orthographic drawings
 | * Meaning of pictorial and orthographic drawings
* Meaning of sectioning
* Meaning of symbols and abbreviations
* Drawing and interpretation of orthographic elevations
* Dimensioning of orthographic elevations
* Sectioning of views
 | * Observation
* Practical tests
* Oral questioning
 |
| 1. Produce pictorial drawings
 | * Meaning of pictorial drawings
* Drawing objects in isometric view
* Drawing objects in oblique view
 | * Observation
* Oral questioning
* Practical tests
 |
| 1. Apply CAD packages
 | * Identification of CAD packages e.g. AutoCAD
* Use of CAD packages in drawing of:
* Plane geometry
* Solid
* Orthographic
* Pictorial
 | * Observation
* Oral questioning
* Practical tests
 |

**Suggested Methods of Delivery**

* Projects
* Demonstration by trainer
* Practice by the trainee
* Discussions

**Recommended Resources**

* Drawing room
* Drawing instruments e.g. T-squares, set squares, drawing sets
* Drawing tables
* Pencils, pens, papers, erasers, sharpeners
* Masking tapes
* Computers installed with relevant CAD packages
* Store

# BUILDING MATERIALS SCIENCE

**UNIT CODE:** ENG/CU/QS/CC/04/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Building Materials Science

**Duration of Unit:** 88 Hours

**Unit Description**

This unit describes the competence in applying building materials science. It involves identifying essential construction materials, selecting quality construction materials, testing construction materials and demonstrating knowledge in use of construction materials.

**Summary of Learning Outcomes**

1. Identify essential construction materials
2. Identify properties of construction materials
3. Manufacture construction materials
4. Select quality construction materials
5. Use construction materials appropriately
6. Test construction materials
7. Handle construction materials safely
8. Store construction materials appropriately

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Identify essential construction materials
 | * Engineering drawings interpretation
* Bills of quantities
* Construction materials
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Identify properties of construction materials
 | * Physical properties of construction materials
* Chemical properties of construction materials
* Mechanical properties of construction materials
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Manufacture construction materials
 | * Raw materials used in manufacturing construction materials
* Procedures of manufacturing construction materials
* Plant and equipment used in manufacturing construction materials
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Select quality construction materials
 | * Properties of quality construction materials
* Construction materials Cost and quality relationship
* Selection of Construction materials
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Use construction materials appropriately
 | * Construction methods and processes
* Appropriate use of construction materials
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Test construction materials
 | * Materials testing parameters
	+ Destructive tests
	+ Non-destructive tests
* Materials testing procedures
* Quality assurance and control
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Handle construction materials safely
 | * User safety in handling construction materials
* Construction Materials handling and storage
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Store construction materials appropriately
 | * Storage and security requirements of materials
* Warehousing operations
 | * Written tests
* Oral
* Practical tests/Project
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Field trips
* Trainee group discussions

**Recommended Resources**

**Tools and equipment**

* Computer
* Laboratory testing equipment
* Laboratory apparatus
* Hand tools
* Machine tools

**Materials and supplies**

* Computer software
* Construction materials
* Computers
* Stationery
* Manufacturer’s catalogues

**Personal protective equipment (PPEs)**

* Safety boots
* Goggles
* Gas masks
* Helmets
* Gloves
* Dust coats
* First aid kit
* Ear muffs
* Dust masks
* Overalls

# WORKSHOP TECHNOLOGY PRACTICES

**UNIT CODE:** ENG/CU/QS/CC/05/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Workshop Technology Practices

**Duration of Unit:** 132 Hours

**Unit Description**

This unit describes the competence in applying workshop technology practices. It entails performing masonry, plumbing and carpentry tasks. It also involves performing electrical and mechanical operations.

**Summary of Learning Outcomes**

1. Perform masonry tasks
2. Perform plumbing tasks
3. Perform carpentry tasks
4. Perform electrical operations
5. Perform welding and sheet metal fabrication

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Perform masonry tasks
 | * Masonry workshop safety requirements
* Masonry hand tools
* Masonry machines
* Maintenance of masonry tools
* Use of masonry tools
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Perform plumbing tasks
 | * Plumbing workshop safety requirements
* Plumbing hand tools
* Plumbing machines
* Maintenance of Plumbing tools
* Use of Plumbing tools
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Perform carpentry tasks
 | * Carpentry workshop safety requirements
* Carpentry hand tools
* Carpentry machines
* Maintenance of Carpentry tools
* Use of Carpentry tools
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Perform electrical operations
 | * Electrical workshop safety requirements
* Measurement of electrical quantities
* IEE regulations
* Electrical conventional tools
* Installation of basic electrical circuits
* Renewable energy
* Power supply
 | * Written tests
* Oral
* Practical tests/Project
 |
| 1. Perform welding and sheet metal fabrication
 | * Mechanical workshop safety requirements
* Welding and sheet metal fabrication hand tools
* Welding and sheet metal fabrication machines
* Use of welding and sheet metal fabrication tools
 | * Written tests
* Oral
* Practical tests/Project
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Field trips
* Trainee group discussions

**Recommended Resources**

**Tools and equipment**

* Masons trowel
* Wood float
* Cold chisels
* Masons square
* Spade
* Shovel
* Plumb bob
* Concrete mixer
* Block cutter
* Vibrator
* Pneumatic hammer
* Compactors
* Bench shears
* Anvil
* Pipe wrench
* Pliers
* Bending machine
* Welding
* Sheet metal holding machine
* Portable power drill
* Saws
* Planes
* Hammer
* Carpenter square
* Marking gauges
* Hand drill
* Screw drivers
* circular saw
* Thicknesser
* Portable sander
* Close cut saw
* Portable drill machine
* phase tester
* screw driver
* pliers
* long nose
* side cutter
* draw in wire
* electrical knife
* electrical hammer
* Arc welding shields
* Leather gloves
* Chipping hammers
* Welding goggles
* Tongs
* Hand vices
* Mole punch
* Pliers
* Centrifugal
* Submersible
* Reciprocating pump
* Hand pumps
* Hand grinder

**Materials and supplies**

* Lumber
* PPR pipes
* PVC pipes
* GI pipes
* Pipe fittings
* Cement
* Sand
* Lime
* Sheet metal
* Steel plates
* Electrical materials
* Electrical appliances
* Plumbing appliances
* Fuel
* Grease
* Oil
* Filters

**Personal protective equipment (PPEs)**

* Helmets
* Gloves
* Safety goggles
* Safety boots
* Overalls
* Dust masks
* Gas masks
* Dust coats

# CORE UNITS OF LEARNING

# ENGINEERING SURVEY

**UNIT CODE:** ENG/CU/QS/CR/01/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Conduct Engineering Survey

**Duration of Unit:** 336 hours

**Unit Description**

This unit describes the competence in conducting engineering survey. It involves conducting area levelling, setting out a building, performing earthworks and carrying out road surveys.

**Summary of Learning Outcomes**

1. Conduct area levelling
2. Set out a building
3. Perform earthworks
4. Carry out road survey

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct levelling
 | * Site clearance
* Reduced levels
* Contours
* Mass haul diagrams
* Levelling
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Set out construction works.
 | * Working drawings
* Site layout plans
* Setting out methods
* Excavation
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Perform earthworks
 | * Working drawings
* Site clearance
* Earthwork cross sections
* Formation levels
* Disposal of excess earthwork materials
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Carry out road survey
 | * Tacheometry survey
* Photogrammetry and survey maps
* Circular curves
* Traversing
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions

**Recommended Resources**

**Tools and equipment**

* Theodolite
* Levelling staff
* Total station
* Surveyors Chain
* Engineers chain
* Tape measures
* Ranging rods
* Tripod stand
* Dumpy level
* Prismatic compass
* Plane table
* Drilling rigs
* Measuring wheel

**Materials and supplies**

* Survey maps
* Working drawings
* Stationery
* Printers
* Computers

**Personal protective equipment (PPEs)**

* Helmet
* Dust coat
* Safety boots
* Goggles
* Dust mask
* Reflective jacket
* Gloves

# BUILDING DRAWINGS

**UNIT CODE:** ENG/CU/QS/CR/02/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Produce Building Drawings

**Duration of Unit:** 168 hours

**Unit Description**

This unit describes the competence in producing building drawings. It involves producing scaled building plans and producing detailed building drawings.

**Summary of Learning Outcomes**

1. Produce scaled building plans
2. Produce detailed building plans

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Produce scaled building plans
 | * Signs and symbols in building drawings
* Lines used in building drawings
* Dimensioning
* Scales used in building drawing
* Floor plans
* Roof plan
* Building elevations
* Building sections
* Computer Aided Design
	+ AutoCAD
	+ ArchiCAD
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Produce detailed building drawings
 | * Building drawing elements
* Exploded views of elements
* Detailed specifications
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions

**Recommended Resources**

**Tools and equipment**

* Drawing tables
* Set squares
* T-Square
* Adjustable squares
* Computers

**Materials and supplies**

* CAD software
* Drawing papers
* Drawing pens/pencils
* Drawing ink
* Tracing papers
* Printing papers

**Personal protective equipment (PPEs)**

* Dust coat

# CIVIL ENGINEERING DRAWINGS

**UNIT CODE:** ENG/CU/QS/CR/03/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Produce Civil Engineering Drawings

**Duration of Unit:** 168 hours

**Unit Description**

This unit describes the competence in producing civil engineering drawings. It involves preparing drainage drawings, preparing water tank drawings, preparing pavement drawings, preparing external works drawings, preparing bridge drawings and preparing waterfront structure drawings

**Summary of Learning Outcomes**

1. Prepare drainage drawings
2. Prepare water tank drawings
3. Prepare pavement drawings
4. Prepare external works drawings
5. Prepare bridge drawings
6. Prepare waterfront drawings
7. Prepare railway track drawings

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare drainage drawings
 | * Drainage survey
	+ Drainage line location
	+ Drain and manhole location
* Determination of invert levels
* Determination of manhole sizes
* Preparation of layout sketch
* Preparation of detailed drainage drawings
* Drainage systems exploded views
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare water tank drawings
 | * Types of water tanks
	+ Elevated water tanks
	+ Underground water tanks
* Determination of pipe layout
* Soil analysis
* Water tank design and detailing
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare pavement drawings
 | * Pavement functions
* Types of pavements
* Pavement layout sketches
* Pavement drawing detailing
* Pavement exploded views
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare external works drawings
 | * Types of external works
	+ Landscaping
	+ Pavements
	+ Hedges
	+ Fencing
	+ Gates
	+ Swimming Pools
	+ Walkways
	+ Parking
* Specifications for external works
* External works detailing
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare bridge drawings
 | * Functions of bridges
* Types of bridges
* bridge drawings
* Bridge drawings detailing
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare waterfront structure drawings
 | * Functions of waterfront structures
* Types of waterfront structures
* Waterfront structure drawings
* Waterfront structure drawing detailing
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare railway track drawings
 | * Types of railway tracks
* Railway track drawings
* Railway track drawing detailing
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare Retaining Wall Drawings
 | * Types Of Retaining Walls
* Retaining Walls Drawings
* Retaining Walls Detailing
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare Tunnel Drawings
 | * Types Of Tunnels
* Tunnel Drawings
* Tunnel Detailing
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions

**Recommended Resources**

**Tools and equipment**

* Drawing tables
* Set squares
* T-Square
* Adjustable squares
* Computers

**Materials and supplies**

* CAD software
* Drawing papers
* Drawing pens/pencils
* Drawing ink
* Tracing papers
* Printing papers

**Personal protective equipment (PPEs)**

* Dust coat

# CONSTRUCTION WORKS

**UNIT CODE:** ENG/CU/QS/CR/04/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Execute Construction Works

**Duration of Unit:** 336 hours

**Unit Description**:

This unit describes the competence in executing construction works. It involves investigating construction site, performing substructure works, performing superstructure works, installing building windows and doors, applying building finishes and carrying out building maintenance.

**Summary of Learning Outcomes**

1. Investigate construction site
2. Perform substructure works
3. Perform superstructure works
4. Install building doors and windows
5. Apply building finishes
6. Carry out building maintenance

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Investigate construction site
 | * Significance of site investigation
* Site investigation procedure
* Site investigation elements/areas
	+ Soil
	+ Existing structures/services
	+ Labour and construction materials
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Perform substructure works
 | * Site clearance
	+ Methods of site clearance
	+ Tools and equipment used in site clearance
	+ Safety issues in site clearance
* Excavation
	+ Methods of excavation
	+ Temporary support to excavations
	+ Groundwater control
* Methods used in levelling
	+ Cut
	+ Fill
	+ Cut and fill
* Profile boards
* Types of profile boards
	+ Corner profile boards
	+ Single profile boards
* Use of profile boards
* Foundations
	+ Types of foundations
	+ Materials used in construction of foundations
* Hard core
	+ Functions of hard core
	+ Materials used
	+ Characteristics of hard core material
* Blinding
	+ Functions of blinding
	+ Materials used
	+ Characteristics of blinding materials
* Anti-termite treatment
	+ Significance of anti-termite treatment
	+ Chemicals used for anti-termite treatment
	+ Safety precautions in chemical handling
* Damp proofing
	+ Significance of damp proofing
	+ Materials used in damp proofing
	+ Characteristics of damp proofing materials
* Concrete bed construction
	+ Mass / plain concrete
	+ Reinforced concrete
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Perform superstructure works
 | * Setting out superstructure works
* Superstructure concrete works
	+ Concrete in columns
	+ Concrete in suspended slabs and beams
	+ Formwork
	+ Reinforcement
	+ Curing of concrete
* Superstructure walling
	+ Forms of wall construction
	+ Types of walls
	+ Materials used in wall construction
	+ Tools and equipment used in wall construction
	+ Damp proofing in walls
* Roof construction
	+ Functional requirements of roofs
	+ Materials used in roof construction
	+ Types of roofs
	+ Parts of a roof
	+ Roof construction procedure
* Roof cover
	+ Types of roof cover materials
		- Traditional roof cover
		- Modern roof cover
	+ Functional requirements of roof covers
	+ Roof underlays
	+ Roof cover laying procedure
		- Tiles
		- Concrete
		- Sheets
		- Thatch grass
		- Makuti
* Rain water goods installation
	+ Gutter
	+ Downpipes
	+ Channels
	+ Fulbora
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Install building doors and windows
 | * Functional requirements of doors and windows
* Classification of doors and windows by:
	+ materials used
	+ Placing of components
	+ method of construction
	+ method of operation
* Preparation of door and window schedule
* Installation procedure for doors and window frames
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Apply building finishes
 | * Types of building finished
* Methods of finishes application
* Finishes application procedures
	+ Tiles
	+ Paints
	+ Parquets
	+ Facing
	+ Pebble dash
	+ Plaster
	+ Render
	+ Floor screed
	+ Granolithic finish
	+ Terrazzo
	+ Cladding
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Carry out building maintenance
 | * Building inspection procedures
	+ Building diagnosis
* Preparation of inspection reports
* Preparation of maintenance program
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions
* Site vists

**Recommended Resources**

**Tools and equipment**

* Excavating tools and equipment
* Profile boards
* Wheelbarrows
* Trowels
* Spirit levels
* Mason squares
* Steel floats
* Motor boards
* Plumb bob
* Steel bending and fixing tools/machines
* Concrete mixers
* Spades
* Sprayer
* Painting brushes
* Levelling equipment

**Materials and supplies**

* Cement
* Water
* Sand
* Ballast
* Reinforcement bars
* Paint
* Tiles
* Terrazzo
* Sheets
* Timber
* Steel
* Damp proofing materials
* Stones
* Bricks
* Murram
* Manufactured boards
* Glass
* Plastic

**Personal protective equipment (PPEs)**

* Dust coat
* Overall
* Helmet
* Safety boots
* Gloves
* First aid kit
* Goggles
* Dust masks

# BILL OF QUANTITIES

**UNIT CODE:** ENG/CU/QS/CR/05/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Prepare Bills of Quantities

**Duration of Unit:** 672 hours

**Unit Description**

 This unit describes the competence in preparing bills of quantities. It involves interpreting working drawings, taking off quantities, working up dimensions, abstracting measured quantities, billing measured works and pricing bill of quantities.

**Summary of Learning Outcomes**

1. Interpret working drawings
2. Take off quantities
3. Work up dimensions
4. Abstract measured quantities
5. Bill measured works
6. Price bill of quantities

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Interpret working drawings
 | * Types of drawings
* Scaling of drawing dimensions
* Additional drawing information
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Take off quantities
 | * Principles of measurement
* Standard methods of measurement of building and associated civil works (SMM) and civil engineering standard method of measurements CESMM)
* Preparation of dimension sheet/paper
* Preparation of list of items to measure
* Computing building/civil works quantities
* Booking of dimensions
* Booked items description
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Work up dimensions
 | * Timesing of dimensions
* Squaring of booked dimensions
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Abstract measured quantities
 | * Abstracting sheet
	+ Preparation of abstracting sheet
	+ Transfer of booked quantities
* Running through dimensions
	+ Symbols used in running through dimensions

Casting Up Dimensions* Symbols Used in casting up
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Bill measured quantities
 | * Billing paper/sheet
	+ Preparation of billing sheet/paper
	+ Transfer of booked quantities
	+ Price bill of quantities
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Estimate cost
 | * Building up unit rates
* Cost estimating
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions

**Recommended Resources**

**Tools and equipment**

* Computers
* Office equipment
* Calculators
* Scale rule

**Materials and supplies**

* Computer software
* CESSM/SMM
* Stationery

**Personal protective equipment (PPEs)**

* Dust coat
* First aid kit

# MANAGE PROJECT CONTRACTS

**UNIT CODE:** ENG/CU/QS/CR/06/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Manage Project Contracts

**Duration of Unit:** 168 hours

**Unit Description**

This unit describes the competence in managing project contracts. It involves preparing tender documents, carrying out tendering process, preparing day works accounts and preparing payment certificates

**Summary of Learning Outcomes**

1. Prepare tender documents
2. Carry out tendering process
3. Prepare day works accounts
4. Prepare payment certificates
5. Prepare variation orders
6. Value variations

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare tender documents
 | * Preparation of working drawings
* Work specifications
* Bill of quantities
* Preparation of schedule of rates
* Preparation of conditions of contract
* Forms of agreement
* Forms of tender
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Carry out tendering process
 | * Tendering methods
* Receiving and opening of tenders
* Tender analysis
* Evaluation and award of tenders
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare day works accounts
 | * Determination of plant, materials and labour costs
* Determination of profits and overheads
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare payment certificates
 | * Types of payment certificates
	+ Interim
	+ Penultimate
	+ Final
* Payment certificate preparation procedure
	+ Site visit
	+ Work re-measurement
	+ Materials on site
	+ Amount of work done
	+ Percentage of work done
	+ Retention fees
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare variation orders
 | * Variation order preparation procedure
* Prepare variation account
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions

**Recommended Resources**

**Tools and equipment**

* Computers
* Office equipment
* Scientific calculators
* Tape measures

**Materials and supplies**

* Computer software
* Stationery

**Personal protective equipment (PPEs)**

* Dust coat
* First aid kit

# CONSTRUCTION PROJECT FINANCE MANAGEMENT

**UNIT CODE:** ENG/CU/QS/CR/07/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Manage Construction Project Finance

**Duration of Unit:** 168 hours

**Unit Description**

This unit describes the competencies required to manage construction project finance. It involves managing pre-construction project finance, preparing financial statements, preparing variation accounts, preparing financial claims, monitoring project costs, preparing final accounts and preparing final certificate.

**Summary of Learning Outcomes**

1. Manage pre-construction project finance
2. Prepare financial statements
3. Prepare variation accounts
4. Prepare financial claims
5. Monitor project costs
6. Prepare final certificate
7. Prepare final accounts

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Manage pre-construction project finance
 | * Preliminary cost estimation
* Preparation of financial cost plan
* Preparation of cash flow statement
	+ Income
	+ Expenditure
	+ Loans
	+ Interest on acquired loans
	+ Salaries/ wages
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare financial statements
 | * Determination of cash inflows
	+ Income from project payments
	+ Loans acquired
	+ Invested cash
	+ Interest on investment
* Determination of cash outflows
	+ Expenditure
	+ Profits and loss account
	+ Balance sheet
	+ Salary payments
	+ Interest on acquired loans
	+ Loan repayment
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare variation accounts
 | * Sources of variations
	+ Statutory authority requirements
	+ Engineer/architect instructions
	+ Client requirements
* Determination of courses of variations
* Determination of value of variations
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare financial claims
 | * Nature of claims
	+ Insurance
	+ Tax
	+ Disputes
	+ Contract delays
	+ Extended project periods
	+ Insufficient information
* Identification of nature of claims
* Preparation of financial claims
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Monitor project costs
 | * Project cost analysis
* Project cost control
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare final accounts
 | * Determination of value of all certificates
	+ Interim
	+ Penultimate
	+ Final
* Determination of value of all claims
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare final certificate
 | * Determination of defects made good value
* Preparation of final certificate
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions

**Recommended Resources**

**Tools and equipment**

* Computers
* Office equipment
* Calculators

**Materials and supplies**

* Computer software
* Stationery

**Personal protective equipment (PPEs)**

* Dust coat
* First aid kit

# CONSTRUCTION PROJECT MANAGEMENT

**UNIT CODE:** ENG/CU/QS/CR/08/6/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Manage Construction Project

**Duration of Unit:** 168 hours

**Unit Description**

This unit describes the competencies required to manage construction project. It involves conducting feasibility study, preparing construction cost budgets, preparing materials, plant and labour schedule, preparing work program, managing construction site, managing construction plant and equipment, preparing project progress report, carrying out project evaluation and participating in site/project handing over.

**Summary of Learning Outcomes**

1. Conduct feasibility study
2. Prepare construction cost budgets
3. Prepare material, plant and labour schedule
4. Prepare work program
5. Manage construction site
6. Manage construction plant and equipment
7. Prepare project progress report
8. Carry out project evaluation
9. Participate in site/project handing over

**Learning Outcomes, Content and Suggested Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Conduct feasibility study
 | * Site visits
* Determination of investment cost
	+ Construction cost
	+ Land cost
	+ Interest
* PESTEL analysis
* Preparation of feasibility study report
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare construction cost budgets
 | * Determination of preliminary costs
* Project costs
	+ Plant
	+ Labour
	+ Materials
	+ Profits and overheads
	+ Statutory authority fees
	+ Consultancy fees
	+ Taxes
* Preparation of cash flow statements
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare materials, plant and labour schedule
 | * Project activities
* Determination of material, labour and plant requirements
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare work program
 | * Project activities
	+ Preliminary activities
	+ Site clearance
	+ Excavations
	+ Foundations
	+ Walling
	+ Concrete works
	+ Roofing
	+ Finishes
	+ External works
* Time estimation
* Resource allocation
* Determination of start and finish times
* Determination of float times
* Determination of critical activities
* Project duration
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Manage construction site
 | * Site layout plan implementation
* Procurement
	+ Project contractor
	+ Materials
	+ Plant
	+ Labour
* Implementation of safety and security measures
* Site records
	+ Materials
	+ Plant
	+ Labour
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Manage construction plant and equipment
 | * Determination of plant and equipment requirement
	+ General
	+ Excavation
	+ Lifting
	+ Transporting
	+ Concrete mixing, transporting, placing and compacting
	+ Drilling and blasting
* Acquisition of plant and equipment
	+ Purchasing
	+ Hiring
* Safety and security requirements
* Preparation of maintenance schedule
* Plant and equipment disposal procedures
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Prepare project progress report
 | * Key performance indicators
* Determination of key performance indicators
* Site visits
* Site inspection
* Site meetings
* Preparation of project progress reports
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Carry out project evaluation
 | * Project evaluation criteria
* Financial evaluation
* Project performance standards
* Project evaluation reports
 | * Written tests
* Oral
* Practical/Projects
 |
| 1. Participate in site/project handing over
 | * Site inspection
* Ascertaining defects made good
* Invoices and claims
* Operator’s manual and maintenance plan and project handing over
 | * Written tests
* Oral
* Practical/Projects
 |

**Suggested Delivery Methods**

* Demonstration by trainer
* Practical work by trainee
* Demonstration videos
* Projects
* Group discussions
* Site vists

**Recommended Resources**

**Tools and equipment**

* Computers
* Office equipment
* Calculators

**Materials and supplies**

* Computer software
* Stationery

**Personal protective equipment (PPEs)**

* Reflective jacket
* Dust coat
* Safety boots
* Helmet
* Goggles
* First aid kit