****

**REPUBLIC OF KENYA**

**COMPETENCY BASED MODULAR CURRICULUM**

**FOR**

**ROAD CONSTRUCTION**

**KNQF LEVEL 5**

**PROGRAMME ISCED CODE: 0732 454 A**

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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 Kenya’s development blue print 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 (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training. The policy document requires that training in TVET shall be competency based, curriculum development shall be industry led, certification shall be based on demonstration of competence and mode of delivery shall allow for multiple entry and exit in TVET programs.

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 Occupational Standard has been developed for the purpose of informing development of a competency-based Road Constructor Level 5 Curriculum. This Occupational Standard will also form the basis for assessment of an individual for competency certification.

It is my conviction that this Occupational Standard will play a great role towards development of a competent human resource for the Construction Sector’s growth and sustainable development.

**PRINCIPAL SECRETARY**

**STATE DEPARTMENT FOR TVET**

**MINISTRY OF EDUCATION**

**PREFACE**

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

TVET ACT, CAP 210A and Sessional Paper No. 1 of 2019 on Reforming Education and Training in Kenya for Sustainable Development emphasized the need to reform curriculum development, assessment, and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry, as well as increase the global competitiveness of the Kenyan labour force.

This curriculum has been developed in adherence to the Kenya National Qualifications Framework and CBETA standards and guidelines. The curriculum is designed and organized into Units of Learning with Learning Outcomes, suggested delivery methods, learning resources, and methods of assessing the trainee’s achievement. In addition, the units of learning have been grouped in modules to concretize the skills acquisition process and streamline upskilling.

I am grateful to all expert trainers and everyone who played a role in translating the Occupational Standards into this competency-based modular curriculum.

**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 were received from expert trainers, institutions and organizations.

I recognize with appreciation the role of the National Sector Skills Committee (NSSC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Construction sector for their valuable input and everyone who participated in developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that individuals aspiring to work in the Construction Sector acquire competencies to perform their work more efficiently and effectively.

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**ABBREVIATIONS AND ACRONYMS**

PPE Personal Protective Equipment

CCTV Closed-Circuit Television (surveillance)

BS British Standards

ICT Information Computer Technology

IEE International Electrical Engineering

BQS Bill of Quantities

CAD Computer Aided Design

CADD Computer aided design drawings

CGA County Government Approvals

DTP Desktop Publishing

EHS Environment, health and safety

EMCA Environmental management and coordination act

EMS Environmental Management System

IFCE The International Federation of Consulting Engineers

JBC Joint building council

KCSE Kenya Certificate of Secondary Education

KEBS Kenya Bureau of Standards

KNQA Kenya National Qualification Authority

NCA National Construction Authority

NEMA National Environment Management Authority

NOS National Occupational Standards

PPE Personal Protective Equipment

QA Quality Assurance

QC Quality Control

TVET Technical and vocational education and training

BRC British reinforcement concrete

ASTM American society for testing and materials

PPR Polypropylene pipes

DPM Damp proof membrane

DPC Damp proof course

IEE Institute of electrical engineers

GI Galvanized iron

OSH Occupational safety and health

OSHA Occupation safety and health act

SOPS Standard operating procedure

CBET Competency-based education and training

# KEY TO UNIT CODE

XX X X XXX X X

Sector/Industry Version Control

Unit of Competence

Sub Sector Number

Occupational Area ISCED level,

Programme

Orientation and Level of

Completion

# COURSE OVERVIEW

Road Constructor Level 5 qualification consists of competencies that an individual must achieve to enable him/her offer Road constructor services. It involves comprising of preparing for materials testing, carrying out site survey, executing road construction works, and carrying out civil works. It also entails executing road maintenance works.

The units of competency comprising this qualification include the following basic, common and core competencies:

**SUMMARY OF UNITS OF LEARNING**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MODULE** | **UNIT CODE** | **UNIT NAME** | **DURATION(Hours)** | **CREDIT**  **FACTOR** |
| **ONE(I)** | 0611 441 01A | DIGITAL LITERACY | 40 | 4.0 |
| 0031 441 02A | COMMUNICATION SKILLS | 40 | 4.0 |
| 0732 441 03A | CONSTRUCTION MATERIAL SCIENCE 1 | 50 | 5.0 |
| 0732 451 04A | SITE SURVEY | 150 | 15.0 |
|  | **SUBTOTAL** | **280 HRS** | **280.0** |
| **TWO (II)** | 0417 441 05A | WORK ETHICS  AND  PRACTICES | 40 | 4.0 |
| 0732 451 06A | MATERIALS TESTING PREPARATION | 100 | 10.0 |
| 0732 451 07A | TECHNICAL DRAWINGS | 130 | 13.0 |
| 0732 441 08A | CONSTRUCTION MATERIAL SCIENCE II | 110 | 11.0 |
|  | **SUBTOTAL** | **380HRS** | **38.0** |
| **THREE (III)** | 0732 441 09A | MATHEMATICS PRINCIPLES | 100 | 10.0 |
| 0732 441 10A | WORKSHOP TECHNOLOGY SKILLS | 50 | 5.0 |
| 0413 441 11A | ENTREPRENEURIAL SKILLS | 40 | 4.0 |
| 0732 451 12A | ROAD CONSTRUCTIONS WORKS I | 110 | 11.0 |
|  | **SUBTOTAL** | **300HRS** | **30.0** |
| **FOUR (IV)** | 0732 451 13A | MATERIALS TESTING I | 50 | 5.0 |
| 0732 451 14A | ROAD  MAINTENANCE WORKS | 60 | 6.0 |
| 0732 451 15A | CIVIL WORKS | 100 | 10.0 |
|  | **SUBTOTAL** | **210HRS** | **21.0** |
|  |  | **INDUSTRIAL ATTACHMENT** | **480HRS** | **48.0** |
| **TOTAL** |  |  | **1650HRS** | **165.0** |

**Entry Requirements**

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

1. Kenya Certificate of Secondary Education (KCSE) mean grade D+ (Plus).

Or

1. Any other qualification equivalent as determined TVETA

**Trainer qualification**

A trainer for this course MUST:

1. Have a higher qualification than this level.
2. Be registered by TVETA

**Industrial attachment**

An individual enrolled in this course will be required to undergo Industrial attachment for a minimum period of 480 hours in a road construction sector. The industrial training may be taken after completion of all units for those pursuing the full qualification or be distributed equally in each unit for those pursuing part qualification. In the case of dual training model, industrial training shall be as guided by the dual training policy.

**Assessment**

The course shall be assessed formatively and summatively:

1. During formative assessment all performance criteria shall be assessed based on performance criteria weighting.
2. Number of formative assessments shall minimally be equal to the number of elements in a unit of competency
3. Assessment of basic and common competencies shall be integrated in the core units
4. Theoretical assessment shall be integrated in practical assessment and conducted orally in both formative and summative assessments.
5. Theoretical and practical weight shall be 30:70 for each unit of learning.
6. Formative and summative assessments shall be weighted at 60% and 40% respectively in the overall unit of learning score
7. Assessment performance rating for each unit of competency shall be as follows:

|  |  |
| --- | --- |
| **MARKS** | **COMPETENCE RATING** |
| 80 -100 | Attained Mastery |
| 65 - 79 | Proficient |
| 50 - 64 | Competent |
| 49 and below | Not Yet Competent |
| Y | Assessment Malpractice/irregularities |

1. Assessment for Recognition of Prior Learning (RPL) may lead to award of part and/or full qualification.

**Certification**

A candidate will be issued with a Certificate of Competency upon demonstration of competence in a core Unit of Competency. To be issued with Kenya **National TVET Certificate** in Road construction Level 5 the candidate must demonstrate competence in all the Units of Competency as given in the qualification pack. A Statement of Attainment certificate may be issued upon demonstration of competence in a certifiable element within a unit.

# MODULE ONE

## DIGITAL LITERACY

**UNIT CODE: 0611 441 01A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply Digital Literacy

**Duration of Unit:** 40 Hours

**Unit Description**

This unit covers the competencies required to demonstrate digital literacy. It involves operating computer devices, solving tasks using the Office suite, managing data and information, performing online communication and collaboration, applying cyber security skills and performing jobs online.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Operate Computer Devices | **6** |
|  | Solve Tasks Using Office Suite | **14** |
|  | Manage Data and Information | **6** |
|  | Perform Online Communication and Collaboration | **4** |
|  | Apply Cyber security Skills | **4** |
|  | Perform Online Jobs | **4** |
|  | Apply job entry techniques | **2** |
|  | **Total** | **40** |

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

| **Learning Outcome** | **Content** | **Suggested**  **Assessment Methods** |
| --- | --- | --- |
| 1. Operate computer devices | * 1. Meaning and importance of digital literacy   2. Functions and Uses of Computers   3. Classification of computers   4. Components of a computer system   5. Computer Hardware      1. The System Unit E.g. Motherboard, CPU, casing      2. Input Devices e.g. pointing, keying, scanning, voice/speech recognition, direct data capture devices.      3. Output Devices e.g. hardcopy output and softcopy output      4. Storage Devices e.g. main memory e.g. RAM, secondary storage (Solid state devices, Hard Drives, CDs & DVDs, Memory cards, Flash drives      5. Computer Ports e.g. HDMI, DVI, VGA, USB type C etc.   6. Classification of computer software   7. Operating system functions   8. Procedure for turning/off a computer   9. Mouse use techniques   10. Keyboard Parts and Use Techniques   11. Desktop Customization   12. File and Files Management using an operating system   13. Computer Internet Connection Options       1. Mobile Networks/Data Plans       2. Wireless Hotspots       3. Cabled (Ethernet/Fiber)       4. Dial-Up       5. Satellite   14. Computer external devices management       1. Device connections       2. Device controls (volume controls and display properties) | * Observation * Written assessment * Oral assessment * Practical assessment |
| 1. Solve tasks using Office suite | * 1. Meaning and Importance of Word Processing   2. Examples of Word Processors   3. Working with word documents      1. Open and close word processor      2. Create a new document      3. Save a document      4. Switch between open documents   4. Enhancing productivity   5. Set basic options/preferences   6. Help resources   7. Use magnification/zoom tools   8. Display, hide built-in tool bar   9. Using navigation tools      1. Typing Text      2. Document editing (copy, cut, paste commands, spelling and Grammar check)   10. Document formatting       1. Formatting text       2. Formatting paragraph       3. Formatting styles       4. Alignment       5. Creating tables       6. Formatting tables   11. Graphical objects       1. Insert object (picture, drawn object)       2. Select an object       3. Edit an object       4. Format an object   12. Document Print setup       1. Page layout,       2. Margins set up       3. Orientation.   13. Word Document Printing   14. Meaning & Importance of electronic spreadsheets   15. Components of Spreadsheets   16. Application areas of spreadsheets   17. Using spreadsheet application       1. Parts of Excel screen: ribbon, formula bar, active cell, name box, column letter, row number, Quick Access Toolbar.       2. Cell Data Types       3. Block operations       4. Arithmetic operators (formula bar (-, +, \*, /).       5. Cell Referencing   18. Data Manipulation   19. Using Functions (Sum, Average, SumIF, Count, Max, Max, IF, Rank, Product, mode etc.)       1. Using Formulae       2. Sorting data       3. Filtering data       4. Visual representation using charts   20. Worksheet printing   21. Electronic Presentations   22. Meaning and Importance of electronic presentations   23. Examples of Presentation Software   24. Using the electronic presentation application       1. Parts of the PowerPoint screen (slide navigation pane, slide pane, notes, the ribbon, quick access toolbar, and scroll bars).       2. Open and close presentations       3. Creating Slides (Insert new slides, duplicate, or reuse slides.)       4. Text Management (insert, delete, copy, cut and paste, drag and drop, format, and use spell check).       5. Use magnification/zoom tools       6. Apply or change a theme.       7. Save a presentation       8. Switch between open presentations   25. Developing a presentation       1. Presentation views       2. Slides       3. Master slide   26. Text       1. Editing text       2. Formatting       3. Tables   27. Charts       1. Using charts       2. Organization charts   28. Graphical objects       1. Insert, manipulate       2. Drawings   29. Prepare outputs       1. Applying slide effects and transitions   30. Check and deliver       1. Spell check a presentation       2. Slide orientation       3. Slide shows, navigation       4. Print presentations (slides and handouts) | 1. Observation 2. Portfolio of Evidence 3. Project 4. Written assessment 5. Practical assessment 6. Oral assessment |
| 1. Manage Data and Information | * 1. Meaning of Data and information   2. Importance and Uses of data and information   3. Types of internet services   Communication Services   * + 1. Information Retrieval Services     2. File Transfer     3. World Wide Web Services     4. Web Services     5. Automatic Network Address Configuration     6. Newsgroup     7. Ecommerce   1. Types of Internet Access Applications   2. Web browsing concepts      1. Key concepts      2. Security and safety   3. Web browsing      1. Using the web browser      2. Tools and settings      3. Clearing Cache and cookies      4. URIs      5. Bookmarks      6. Web outputs   4. Web based information   Search   * + 1. Critical evaluation of information     2. Copyright, data protection   1. Downloads Management   2. Performing Digital Data Backup (Online and Offline)   3. Emerging issues in internet | 1. Observation 2. Portfolio of Evidence 3. Project 4. Written assessment 5. Practical assessment 6. Oral assessment |
| 1. Perform online communication and collaboration | 1. Netiquette principles 2. Communication concepts   4.2.1 Online communities  4.2.2 Communication tools   * + 1. Email concepts   1. Using email   4.3.1. Sending email  4.3.2 Receiving email  4.3.3 Tools and settings   * + 1. Organizing email   1. Digital content copyright and licenses   2. Online collaboration tools      1. Online Storage (Google Drive)      2. Online productivity applications (Google Docs & Forms)      3. Online meetings (Google Meet/Zoom)      4. Online learning environments      5. Online calendars (Google Calendars)      6. Social networks (Facebook/Twitter - Settings & Privacy)   3. Preparation for online collaboration      1. Common setup features   Setup   * 1. Mobile collaboration      1. Key concepts      2. Using mobile devices      3. Applications      4. Synchronization | 1. Observation 2. Portfolio of Evidence 3. Project 4. Written assessment 5. Practical assessment 6. Oral assessment |
| 1. Apply cyber security skills | * 1. Data protection and privacy      1. Confidentiality of data/information      2. integrity of data/information      3. Availability of data/information      4. Internet security threats   2. Malware attacks      1. Social engineering attacks      2. Distributed denial of service (DDoS)      3. Man-in-the-middle attack (MitM)      4. Password attacks      5. IoT Attacks      6. [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks)      7. [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware)      8. Computer threats and crimes      9. Cyber security control measures   3. Physical Controls   4. Technical/Logical Controls (Passwords, Pins, Biometrics)   5. Operational Controls      1. Laws governing protection of ICT in Kenya   6. The Computer Misuse and Cybercrimes Act No. 5 of 2018   7. The Data Protection Act No. 24 Of 2019 | 1. Observation 2. Portfolio of Evidence 3. Project 4. Written assessment 5. Practical assessment 6. Oral assessment |
| 1. Perform Online Jobs | * 1. Introduction to online working   2. Types of online Jobs   3. Online job platforms      1. Remo task      2. Data annotation tech      3. Cloud worker      4. Up work      5. Uniform      6. Append   4. Online account and profile management      1. Identifying online jobs/job bidding      2. Online digital identity      3. Executing online tasks      4. Management of online payment accounts. | 1. Observation 2. Portfolio of Evidence 3. Project 4. Written assessment 5. Practical assessment 6. Oral assessment |
| 1. Apply job entry techniques | * 1. Types of job opportunities      1. Self-employment      2. Service provision      3. product development      4. salaried employment   2. Sources of job opportunities   3. Resume/ curriculum vitae      1. What is a CV      2. How long should a CV be      3. What to include in a AC      4. Format of CV      5. How to write a good CV      6. Don’ts of writing a CV   4. Job application letter      1. What to include      2. Addressing a cover letter      3. Signing off a cover letter   5. Portfolio of Evidence      1. Academic credentials      2. Letters of commendations      3. Certification of participations   6. Awards and decorations   Interview skills   * + 1. Listening skills     2. Grooming     3. Language command     4. Articulation of issues     5. Body language     6. Time management     7. Honesty   1. Generally knowledgeable in current affairs and technical area | * + Observation   + Oral assessment   + Portfolio of evidence   + Third party report  1. Written assessment |

**Suggested Methods Instruction**

* + Instructor-led facilitation using active learning strategies
  + Demonstration by trainer
  + Practical work by trainees
  + Viewing of related videos
  + Group discussions
  + Project
  + Role play
  + Case study

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks | Recommended publisher | 8 pcs | 1:3 |
|  | Samples of CVs | Various formats | 5 | 1:5 |
|  | Internet connection | Reliable | - | - |
|  | Flashcards | For trainer’s & trainee’s use | 2 pcs each | 2:1 |
|  | White board | For trainer’s use | 1 | - |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room | 72 Square Meter | 1 | 1:25 |
|  | Computer Lab | 96 Square Meter | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Ink | Assorted Colours for trainer’s use | 500ml per term | - |
|  | White board Marker | Refillable type | 10 pcs per term | - |
|  | Printing papers | sufficient | - | - |
| **D** | **Tools and Equipment** |  |  |  |
|  | Computers | Latest version with:  Windows/Linux/Macintosh Operating System, Microsoft Office Software, Google Workspace Account, Antivirus Software | 25 | 1:1 |
|  | Projector | Latest version | 1 | 1:25 |
|  | External storage media | Latest version | 25 | 1:1 |
|  | Laptop | Intel core i5 | 25 | 1:1 |
|  | printers | Latest version | 2 | 1:13 |

## COMMUNICATION SKILLS

**UNIT CODE:** **0031 441 02A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply Communication Skills

**Duration of Unit:** 40 hours

**Unit Description**

This unit covers the competencies required to apply communication skills. It involves applying communication channels, written, non-verbal, oral, and group communication skills.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/NO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Apply communication channels. | **10** |
|  | Apply written communication skills. | **12** |
|  | Apply non-verbal skills. | **4** |
|  | Apply oral communication skills. | **4** |
|  | Apply group communication skills. | **10** |
|  | **Total** | **40** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply communication channels | * 1. Communication process   2. Principles of effective communication   3. Channels/medium/modes of communication   4. Factors to consider when selecting a channel of communication   5. Barriers to effective communication   6. Flow/patterns of communication   7. Sources of information   8. Organizational policies | * Oral questions * Written assessment * Observation * Portfolio of Evidence * Practical assessment * Third party report |
| 1. Apply written communication skills | * 1. Types of written communication   2. Elements of communication   3. Organization requirements for written communication | * Oral assessment * Written assessment * Observation * Portfolio of Evidence * Practical assessment * Third party report |
| 1. Apply non-verbal communication skills | * 1. Utilize body language and   2. gestures   3. Apply body posture   4. Apply workplace dressing code | * Oral assessment * Written assessment * Observation * Portfolio of Evidence * Practical assessment * Third party report |
| 1. Apply oral communication skills | * 1. Types of oral communication pathways   2. Effective questioning techniques   3. Workplace etiquette   4. Active listening | * Oral assessment * Written assessment * Observation * Portfolio of Evidence * Practical assessment * Third party report |
| 1. Apply group discussion skills | * 1. Establishing rapport   2. Facilitating resolution of issues   3. Developing action plans   4. Group organization techniques   5. Turn-taking techniques   6. Conflict resolution techniques   7. Team-work | * Oral assessment * Written assessment * Observation * Portfolio of Evidence * Practical assessment |

**Suggested Methods of Instruction**

* Discussion
* Roleplaying
* Simulation
* Direct instruction
* Demonstration
* Field trips

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1 | Textbooks | Recommended publisher | 8 pcs | 1:3 |
| 2 | Report writing templates | Various formats | 25 | 1:1 |
| 3 | Internet connection | Reliable | - | - |
| 4 | White board | For trainer’s use | 1 | - |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room | 72 Square Meter | 1 | 1:25 |
|  | Computer Lab | 96 Square Meter | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Ink | Assorted Colours for trainer’s use | 500ml per term | - |
|  | Flash cards | Sufficient | - | - |
|  | White board Marker | Refillable type | 10 pcs per term | - |
|  | Flip charts | Sufficient | - | - |
|  | Printing papers | sufficient | - | - |
| **D** | **Tools and Equipment** |  |  |  |
|  | Computers | Latest version | 25 | 1:1 |
|  | Projector | Latest version | 1 | 1:25 |
|  | External storage media | Latest version | 25 | 1:1 |
|  | Mobile phones | Latest version | 25 | 1:1 |
|  | printers | Latest version | 2 | 1:13 |

## CONSTRUCTION MATERIAL SCIENCE 1

**UNIT CODE: 0732 451 03A**

**Duration of Unit:** 50 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply construction material science

**UNIT DESCRIPTION**

This unit describes the competence in applying Construction materials science. It involves identifying essential construction materials and their properties, selecting quality construction materials.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/NO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | To Identify essential construction materials | **15** |
|  | To Identify properties of construction materials | **20** |
|  | To Select quality construction materials | **15** |
|  | **Total** | **50** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Identify essential construction materials | * 1. Bill of quantities and working drawings      1. Building      2. Roadwork’s      3. Roadwork’s      4. Interpretation   2. Construction materials identification:      1. Stones      2. Bricks      3. clay and clay products      4. lime      5. cement      6. timber and timber products      7. metals and alloys      8. paints and varnishes      9. roofing materials      10. Aggregates      11. Glass and glass products | * Observation * Oral questioning * Written tests * Practical’s |
| 1. Identify properties of construction materials | * 1. Physical properties of construction materials      1. Porosity      2. Surface texture      3. Strength      4. Density      5. Thermal conductivity      6. Wear and tear   2. Chemical properties of construction materials      1. Corrosion resistance      2. Chemical resistance   3. Mechanical properties of construction materials      1. Toughness      2. Hardness      3. Fatigue      4. Stress and strain      5. Creep and stress rapture      6. Strength: | * Observation * Oral questioning * Written tests * Practical’s |
| 1. Select quality construction materials | * 1. Cost implications of construction materials   2. Quality of construction materials   3. Selection criteria of construction materials.      1. Cost      2. Availability      3. Project requirement | * Observation * Oral questioning * Written tests * Practical’s |

**Suggested Methods of Delivery**

* Projects
* Group discussions
* Direct instruction
* Practical’s
* Third party reports

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Material science reference books | For trainee’s use | 14 | 1:2 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | Lecture room | 9m by 8m | 1 | 1:25 |
|  | Material testing laboratory | 9m by 8m | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Whiteboard markers | For trainer’s use | 2 pc | 1:1 |
|  | Lime | For trainee’s use | Sufficient | 1:5 |
|  | Cement | For trainee’s use | Sufficient | 1:5 |
|  | Coarse and fine aggregate | For trainee’s use | Sufficient | 1:5 |
| **D** | **Tools and Equipment** | | | |
|  | Slump test tools | For trainee’s use | 5 pcs | 1:5 |
|  | Compaction factor test tools & equipment | For trainee’s use | 5 pcs | 1:5 |

## SITE SURVEY

**UNIT CODE: 0732 451 04A**

**UNIT DURATION:** 150 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Carry out Site Survey

**Unit Description**

This unit specifies the competencies required to carrying out site survey**.** It involves undertaking preliminary site survey, setting out civil structures and establishing survey control points.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/NO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | To undertake preliminary site survey | **30** |
|  | To Set out civil structures | **60** |
|  | To Establish survey control points | **60** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Undertake preliminary site survey | * 1. Preliminary site survey plan      1. Purpose and Objectives      2. Site Analysis      3. Data Collection Methods      4. Resources and Equipment      5. Data Management      6. Constraints and Limitations      7. Risk Assessment      8. Survey Plan Layout      9. Coordination with Stakeholders      10. Preliminary Cost Estimation      11. Legal and Regulatory      12. Documentation and Reporting   2. Survey resources:      1. Human resources      2. Tools; Driving hammers, Pegs, measuring tapes, Cutting tools, Equipment Electric Distance Measurement (EDM) machines, Theodolite (CWT), Total Station (TS), Dumpy level, Levelling staff      3. Stationery; Surveyors filed notebooks, Pencil, Grid papers.      4. Legal documents; Field permits & Registration certificates      5. Power back-ups      6. Location maps   3. Working drawings:      1. Topographic maps      2. Site plan      3. Profile drawings   4. Site conditions:      1. Topography      2. Soil type and profiles      3. Vegetation      4. Settlements      5. Drainage      6. Weather conditions      7. Utility services; underground electric cables, pipe lines & data cables      8. Water table   5. Original ground level (ogle)      1. Procedure for Establishing Original Ground Level (OGL)      2. Data Collection Techniques for OGL      3. Documentation of OGL Measurements      4. Standards and Accuracy Requirements      5. Integration of OGL Data with Design Plans      6. Compliance with Job Requirements      7. Review and Validation of OGL Data      8. Reporting and Presentation of OGL Data      9. Legal and Regulatory Documentation   6. Reference points:      1. Procedure for Establishing Reference Points      2. Types of Reference Points Used      3. Criteria for Reference Point Placement      4. Methods of Marking and Identifying Reference Points      5. Accuracy and Precision Standards      6. Integration of Reference Points with Project Plans      7. Verification and Validation of Reference Points      8. Documentation of Reference Points Data   7. Preliminary survey report:      1. Compilation of Survey Data      2. Analysis of Survey Findings      3. Accuracy and Validation of Collected Data      4. Presentation of Topographical and Geotechnical Information      5. Identification of Site Constraints and Environmental Factors      6. Conclusions Based on Data Analysis      7. Recommendations for Project Planning      8. Documentation of Results with Visual Aids (maps, charts, diagrams) | * Projects * Reports * Written Tests * Practical |
| 1. Set out civil structures | * 1. Setting out tools and equipment:      1. Strings      2. Tape measures      3. Ranging rods      4. Pegs      5. Cutting tools      6. Driving tools      7. Angle measuring tools      8. Plumb bob      9. Marking tools and equipment   2. Calibration of setting out equipment:      1. Calibration Process      2. Manufacturer’s Manual      3. Documentation and Records      4. Common Calibration Issues      5. Training and Best Practices   3. Proposed alignment:      1. Understanding Job Specifications      2. Site Assessment and Surveying      3. Alignment Methods and Techniques      4. Drafting and Planning      5. Review and Approval Process   4. Horizontal and vertical alignment.      1. Definition of Horizontal and Vertical Alignment      2. Surveying Methods for Alignment      3. Tools and Equipment for Setting Out      4. Establishing Control Points      5. Techniques for Horizontal Alignment      6. Techniques for Vertical Alignment      7. Factors Affecting Alignment      8. Verification and Quality Assurance   5. Computation of alignment data:      1. Data Collection Methods      2. Types of Alignment Data      3. Mathematical Principles Involved      4. Software and Tools for Computation      5. Adjusting for Measurement Errors      6. Interpreting Computed Data      7. Documentation and Reporting of Results   6. Setting out tools and equipment are maintenance:      1. Regular Inspection and Assessment      2. Cleaning Procedures      3. Calibration and Adjustment      4. Lubrication of Moving Parts      5. Repair and Replacement of Worn Components      6. Storage Best Practices      7. Following Manufacturer’s Guidelines      8. Documentation of Maintenance Activities | * Written tests * Reports * Practical * Projects |
| 1. Establish survey control points (LEVELLING) | * 1. Survey tools and equipment      1. Dumpy level, tilting levels and automatic levels      2. Levelling staff      3. Tilting levels      4. Automatic levels      5. Tape measure      6. Pegs      7. Ranging rods   2. Calibration of Survey tools and equipment:      1. Types of Survey Tools Requiring Calibration      2. Calibration Standards and Procedures      3. Calibration Tools and Instruments      4. Following Manufacturer’s Guidelines      5. Recording Calibration Data   3. Site survey control points;      1. TBM (temporary benchmark)      2. BM (permanent benchmark)      3. Arbitrary   4. Levelling works:      1. Temporary adjustment;      2. Booking levels;      3. Calculation of reduced levels,      4. Arithmetic checks | * Written tests * Observations * Reports * Practical |

**Suggested Methods of instruction**

1. Group Discussion
2. Direct Instruction
3. Demonstration
4. Practical
5. Projects
6. Role playing
7. Viewing of related videos

5

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| 1. **A** | **Learning Materials** | | | |
|  | Topographic maps | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Traffic Data | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Survey maps | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Site plans | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Geological and soil maps | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Surveyors field note books | For trainer’s use | 1 pc | 1:25 |
|  | pencils | For trainer’s use | 1 pc | 1:25 |
|  | Grid papers | For trainer’s use | 1 pc | 1:25 |
| **D** | **Tools and Equipment** | | | |
|  | Driving hammers | For trainee’s use | 5 pcs | 1:5 |
|  | pegs | For trainee’s use | sufficient | 1:1 |
|  | Measuring tapes | For trainee’s use | 5 | 1:5 |
|  | Cutting tools | For trainee’s use | 1 | 1:25 |
|  | theodolites | For trainee’s use | 5 pcs | 1 |
|  | Total stations | For trainee’s use | 5 pcs | 1:5 |
|  | Dumpy level | For trainee’s use | 5 pcs | 1:5 |
|  | Levelling staff | For trainee’s use | 5 pcs | 1:5 |

# MODULE TWO

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Unit Duration (Hours)** | **Credit** |
| 0417 441 03B | APPLY WORK ETHICS AND PRACTICES | 30 | 3 |
| 0732 451 09A | PREPARE FOR MATERIAL TESTING | 100 | 10 |
| 0732 441 06A | PREPARE AND INTERPRET  TECHNICAL DRAWINGS | 130 | 13 |
| 0732 441 07A | APPLY CONSTRUCTION MATERIAL SCIENCE II | 40 | 4 |

## WORK ETHICS AND PRACTICES

**UNIT CODE:** **0417 441 05A**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply work ethics and practices.

**Duration of Unit:** 40 hours

**Unit Description**

This unit covers competencies required to demonstrate employability skills. It involves the ability to: conduct self-management, promote ethical work practices and values, promote teamwork, manage workplace conflicts, maintain professional and personal development, apply problem-solving, and promote customer care

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Apply self-management skills | **10** |
|  | Promote ethical practices and values | **4** |
|  | Promote Teamwork | **10** |
|  | Maintain professional and personal development | **10** |
|  | Apply Problem-solving skills | **4** |
|  | Promote Customer care. | **2** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply self-management skills | * 1. Self-awareness   2. Formulating personal vision, mission, and goals   3. Healthy lifestyle practices   4. Strategies for overcoming work challenges   5. Emotional intelligence   Coping with Work Stress.   * 1. Assertiveness versus aggressiveness and passiveness   2. Developing and maintaining high self-esteem   3. Developing and maintaining positive self-image   4. Time management   5. Setting performance targets   6. Monitoring and evaluating performance targets | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Promote ethical work practices and values | * 1. Integrity   2. Core Values, ethics and beliefs   3. Patriotism   4. Professionalism   5. Organizational codes of conduct   6. Industry policies and procedures | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Promote Teamwork | * 1. Types of teams   2. Team building   3. Individual responsibilities in a team   4. Determination of team roles and objectives   5. Team parameters and relationships   6. Benefits of teamwork   7. Qualities of a team player   8. Leading a team   9. Team performance and evaluation   10. Conflicts and conflict resolution   11. Gender and diversity mainstreaming   12. Developing Healthy workplace relationships   13. Adaptability and flexibility   14. Coaching and mentoring skills | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Maintain professional and personal development | * 1. Personal vs. professional development and growth   2. Avenues for professional growth   3. Recognizing career advancement   4. Training and career opportunities   5. Assessing training needs   6. Mobilizing training resources   7. Licenses and certifications for professional growth and development   8. Pursuing personal and organizational goals   9. Managing work priorities and commitments   10. Dynamism and on-the-job learning | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Apply Problem-solving skills | 1. Causes of problems 2. Methods of solving problems 3. Problem-solving process 4. Decision making 5. Creative thinking and critical thinking process in development of innovative and practical solutions | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |
| 1. Promote Customer Care | * 1. Identifying customer needs   2. Qualities of good customer service   3. Customer feedback methods   4. Resolving customer concerns   5. Customer outreach programs   6. Customer retention | * Observation * Written assessment * Oral assessment * Third party reports * Portfolio of evidence * Project * Practical |

**Suggested Methods of Instruction**

* Instructor lead facilitation of theory using active learning strategies.
* Demonstrations
* Simulation/Role play
* Group Discussion
* Presentations
* Projects
* Case studies
* Assignments

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1 | Textbooks | Recommended publisher | 8 pcs | 1:3 |
| 2 | Report writing templates | Various formats | 25 | 1:1 |
| 3 | Internet connection | Reliable | - | - |
| 4 | White board | For trainer’s use | 1 | - |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room | 72 Square Meter | 1 | 1:25 |
|  | Computer Lab | 96 Square Meter | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Ink | Assorted Colours for trainer’s use | 500ml per term | - |
|  | Flash cards | Sufficient | - | - |
|  | White board Marker | Refillable type | 10 pcs per term | - |
|  | Flip charts | Sufficient | - | - |
|  | Printing papers | sufficient | - | - |
| **D** | **Tools and Equipment** |  |  |  |
|  | Computers | Latest version | 25 | 1:1 |
|  | Projector | Latest version | 1 | 1:25 |
|  | External storage media | Latest version | 25 | 1:1 |
|  | Mobile phones | Latest version | 25 | 1:1 |
|  | printers | Latest version | 2 | 1:13 |

## MATERIAL TESTING PREPARATION

**UNIT CODE: 0732 451 06A**

**UNIT DURATION:** 100Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: prepare for materials testing

**Unit Description**

This unit describes the competencies required in preparing for materials testing. It involves organizing for material testing, sampling construction materials and preparing samples for testing.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | To Organize for material testing | 20 |
|  | To Sample construction materials | 40 |
|  | To Prepare samples for testing | 40 |
|  | **Total** | **100** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Organize for material testing | * 1. Preliminary site investigation      1. Purpose and importance      2. Methods of investigation      3. Stages of site investigation      4. Site assessment tools   2. Types of material tests      1. Mechanical tests      2. Chemical tests      3. Non-destructive testing   3. Material laboratory personnel      1. Roles and responsibilities (lab technicians, quality control etc)      2. Required qualifications and certifications      3. Safety protocols and training   4. Laboratory equipment maintenance      1. Types of laboratory equipment      2. Routine maintenance procedures   5. Testing equipment      1. types and uses | * practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Sample construction materials | * 1. Sources of construction materials      1. Natural sources      2. Manufactured materials      3. Recycled materials   2. Sampling procedures      1. purpose of sampling in construction      2. Types of sampling methods      3. Equipment used for sampling   3. Sampling tools and equipment      1. Types and uses   4. Sampling is carried out as per job requirement      1. Understanding project specifications and requirements      2. Customizing sampling plans for specific materials      3. Quality control and assurance considerations   5. Samples analysis      1. Laboratory testing methods      2. Interpreting test results      3. Comparison against industry standards and specifications      4. Reporting and documentation of findings | * practical * Projects * Portfolio of evidence * Third party reports * Written tests |
| 1. Prepare samples for testing | * 1. Sample tests      1. Methods of sampling      2. standard manuals and procedures      3. Overview of the sampling process      4. Preparation before collection      5. Techniques for effective sample collection   2. Sample testing tools and apparatus      1. Types and uses   3. Samples collection      1. Purpose and importance of standard manuals      2. Types of standard manuals      3. Key organizations that publish standards | * practical * Projects * Portfolio of evidence * Third party reports * Written tests |

**Suggested Methods of Instruction**

1. Role playing
2. Viewing of related videos
3. Discussion
4. Direct Instruction
5. Practicals
6. Projects

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Soil testing manual | For trainee’s use | 14 | 1:2 |
| 1. **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | Material testing lab | For trainer’s use | 1 pc | 1:25 |
|  | concrete | For trainer’s use | sufficient | 1:1 |
|  | timber | For trainer’s use | sufficient | 1:1 |
|  | bitumen | For trainer’s use | sufficient | 1:1 |
|  | cement | For trainer’s use | sufficient | 1:1 |
| **C** | **Consumable materials** | | | |
|  | Assorted color of whiteboard markers | For trainee’s use | 10 pcs | 10:1 |
|  | Masking Tape | For trainee’s use | 1pc | 25:1 |
|  | Drawing stationery | For trainee’s use | 25 pcs per stationery | 1:1 |
| **D** | **Tools and Equipment** | | | |
|  | moulds | For trainee’s use | 5 pcs | 1:5 |
|  | Tamping rods | For trainee’s use | 5 pcs | 1:1 |
|  | br test machine | For trainee’s use | 2 | 1:10 |
|  | Rammer | For trainee’s use | 1 | 1:25 |
|  | Riffle box | For trainee’s use | 5 pcs | 1 |
|  | Casagrande machine | For trainee’s use | 5 pcs | 1:5 |
|  | Penetrometer | For trainee’s use | 5 pcs | 1:5 |
|  | Weighing machine | For trainee’s use | 5 pcs | 1:5 |
|  | Oven | For trainee’s use | 1 | 1:25 |
|  | Measuring cylinder | For trainee’s use | 5 | 1:5 |
|  | Cone cups | For trainee’s use | 5 | 1:5 |
|  | Bowl | For trainee’s use | 5 | 1:5 |
|  | Stirring stick | For trainee’s use | 5 | 1:5 |
|  | Crushing machine | For trainee’s use | 1 | 1:25 |
|  | Moisture bags | For trainee’s use | 5 bags | 1;5 |
|  | Funnnels | For trainee’s use | 5 | 1:5 |
|  | Standard sieves | For trainee’s use | 5 | 1:5 |
|  | spade | For trainee’s use | 5 | 1:5 |
|  | trowel | For trainee’s use | 5 | 1:5 |
|  | Jembe | For trainee’s use | 5 | 1:5 |
|  | Mattock | For trainee’s use | 5 | 1:5 |
|  | Circular cutter | For trainee’s use | 5 | 1:5 |
|  | Spatula | For trainee’s use | 5 | 1:5 |
|  | chisel | For trainee’s use | 5 | 1:5 |

## TECHNICAL DRAWINGS

**UNIT CODE: 0732 451 07A**

**Duration of Unit:** 130 Hours

**Relationship to Occupational Standards**

This unit addresses the unit of competency:  **Apply technical drawing**

**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, producing plain geometry drawings, solid geometry drawings, pictorial and orthographic drawings .

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Select, use and maintain drawing equipment and materials | **10** |
|  | Produce plane geometry drawings | **20** |
|  | Produce solid geometry drawings | **40** |
|  | Produce orthographic and pictorial drawings | **60** |
|  | **Total** | **130** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Select, use and maintain drawing equipment and materials | * 1. Terms and concepts   2. Drawing equipment      1. Drawing boards      2. T-square      3. set squares      4. ruler      5. pair of compass      6. divider      7. protractor      8. drawing board      9. drawing clips   3. Drawing materials      1. Drawing papers      2. Pencils      3. Erasers      4. masking tapes   4. Use, care and maintenance of drawing equipment’s   5. Disposal of waste materials | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Produce plane geometry drawings | * 1. Terms and concepts.   2. Types of lines in drawings.      1. Bold continuous line      2. Medium continuous line      3. Thin continuous line      4. Centre line      5. Dash line      6. Zig zag line      7. Wave line      8. Sectional line   3. Geometric forms      1. Triangles      2. Polygons      3. Rectangles      4. Square      5. Parallelogram      6. Pyramid   4. Angle construction   5. Bisection of angles   6. Freehand sketching   7. Construction, measurement and bisection of angles   8. Standards drawing conventions | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Produce solid geometry drawings | * 1. Terms and concepts   2. Interpretation of sketches and drawings of patterns:      1. Cylinders,      2. Prisms and      3. Pyramids   3. Develop geometrical solid figures      1. prisms,      2. cones,      3. truncated   4. Surface development:      1. Geometric Shapes      2. Net | * Written tests * Oral questioning * Assignments * Supervised exercises |
| 1. Produce orthographic and pictorial drawings | * 1. Terms and concepts   2. Symbols and abbreviations   3. First and third angle orthographic drawings   4. Orthographic elevations      1. Dimensioning of orthographic elevations      2. Conversion of orthographic to pictorial   5. Isometric drawings   6. Oblique drawings   7. Free hand sketching | * Written tests * Oral questioning * Assignments * Supervised exercises * Practical |

**Suggested methods of instructions**

1. Group discussions
2. Demonstration
3. Direct instruction

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Technical drawing reference books | For trainee’s use | 14 | 1:2 |
|  | Rulers, protractors and compasses, set-squares | For trainer’s use | 2 pcs each | 2:1 |
|  | A3 drawing papers; Drawing instruments e.g. T-squares, set squares, drawing sets | For trainee’s use | 25 pcs | 1:1 |
|  | Drawing instruments e.g. T-squares, set squares, drawing sets | For trainee’s use | 25 pcs | 1:1 |
|  | Building Drawings samples | For both trainer’s and trainee’ use | 25 pcs | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | Technical Drawing room | 9m by 8m | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Assorted color of whiteboard markers | For trainee’s use | 10 pcs | 10:1 |
|  | Masking Tape | For trainee’s use | 1pc | 25:1 |
|  | Drawing stationery; Pencils, papers, erasers | For trainee’s use | 25 pcs per stationery | 1:1 |
| **D** | **Tools and Equipment** | | | |
|  | Technical Drawing Instruments | For trainee’s use | 25 pcs | 1:1 |
|  | Drawing Board | For trainee’s use | 25 pcs | 1:1 |
|  | Computer with AUTOCAD | For trainee’s use | 25 pcs | 1:1 |

## CONSTRUCTION MATERIAL SCIENCE II

**UNIT CODE: 0732 451 08A**

**Duration of Unit:** 110 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Apply construction material science

**UNIT DESCRIPTION**

This unit describes the competence in testing construction materials and demonstrating knowledge in the handling and use of construction materials. It involves carrying out earthwork activities, constructing pavement layers and transportation infrastructure.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Carry out earthwork activities | **30** |
|  | Construct pavement layers | **40** |
|  | Construct transportation infrastructure | **40** |
|  | **Total** | **110 HOURS** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| * + 1. Test construction materials | * 1. Sampling of construction materials      1. Random,      2. Systematic,      3. Convenience,      4. Cluster,      5. Stratified   2. Test parameters identification:      1. Compression      2. Weathering      3. Durability      4. Water absorption      5. impurity tests      6. Tensile tests      7. Workability      8. Plasticity      9. Aggregates crushing value      10. Optimum moisture content   3. Testing of construction materials | * Observation * Oral questioning * Written tests * Practical’s |
| * + 1. Handle construction materials | 1. Terms and concepts 2. Storage 3. Material Staging 4. Transportation 5. Material Protection 6. Quality Control and Inspection 7. Lifting and Hoisting 8. Inventory Management 9. Site Logistics 10. Identification of construction material     * 1. Determining the type,       2. Properties, Suitability of materials used in building and construction 11. Construction safety requirement’s     * 1. Personal Protective Equipment (PPE)       2. Material Handling Training       3. Proper Storage of Materials       4. Handling Specific Materials with Care       5. Inspect Tools and Equipment Regularly       6. Safe Transportation on Site       7. Safety Signage and Communication       8. Minimize Dust and Hazardous Emissions 12. Handling of construction materials     * 1. Mechanical Handling with Equipment       2. Manual Handling of Materials       3. Storage and Stacking       4. Material-Specific Handling Guidelines       5. Transportation of Materials on Site       6. Waste and Recycling Management       7. Minimizing Waste and Damage | * Observation * Oral questioning * Written tests * Practical’s |
| * + 1. Use construction materials | * 1. Construction materials, tools and equipment assembly  1. Construction Materials 2. Construction Tools 3. Construction Equipment 4. Assembly Techniques    1. Preparation of construction materials 5. Concrete Preparation 6. Glass Preparation 7. Wood and Timber Preparation 8. Steel and Reinforcement Bar (Rebar) Preparation 9. Ceramic Tile Preparation 10. Proper Storage and Organization     1. The construction process: 11. Site Preparation and Foundations 12. Structural Framework 13. Flooring 14. Walls and Partitions 15. Roofing 16. Doors and Windows 17. Exterior Finishes 18. Interior Finishes 19. Plumbing and Electrical Systems 20. HVAC and Insulation 21. Landscaping and Site Work     1. Use of construction material:        1. Concrete: Foundations and Structural Elements; Decorative Concrete; Pavements and Sidewalks:        2. Steel: Structural Framing, Reinforcement for Concrete (Rebar); Cladding and Roofing:        3. Wood (Timber): Framing and Support Structures; Finishes and Aesthetics; Temporary Structures:        4. Bricks and Blocks: Wall Construction: Aesthetic and Facade Elements; Fire-Resistant Barriers:        5. Glass:        6. Ceramic Tiles and Stone        7. Asphalt        8. Aggregate (Gravel, Sand)        9. PVC and Plumbing Materials        10. Paints and Finishes | * Observation * Oral questioning * Written tests * Practical’s |

**Suggested Methods of Delivery**

1. Projects
2. Group discussions
3. Direct instruction
4. Practical’s
5. Third party reports

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Material science reference books | For trainee’s use | 14 | 1:2 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | Lecture room | 9m by 8m | 1 | 1:25 |
|  | Material testing laboratory | 9m by 8m | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Whiteboard markers | For trainer’s use | 2 pc | 1:1 |
|  | Lime | For trainee’s use | Sufficient | 1:5 |
|  | Cement | For trainee’s use | Sufficient | 1:5 |
|  | Coarse and fine aggregate | For trainee’s use | Sufficient | 1:5 |
| **D** | **Tools and Equipment** | | | |
|  | Slump test tools | For trainee’s use | 5 pcs | 1:5 |
|  | Compaction factor test tools & equipment | For trainee’s use | 5 pcs | 1:5 |

# 

# MODULE THREE

## MATHEMATICAL PRINCIPLES

**UNIT CODE: 0441 451 09A**

**UNIT DURATION:** 100Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: **apply mathematical principles**

**Unit Description**

This unit describes the competencies required in applying basic mathematics. It involves applying basic arithmetic, applying basic algebra, and applying trigonometry, performing geometrical calculations, carrying out mensuration, applying statistics and applying linear graphs.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | To apply arithmetical principles | **10** |
|  | To perform algebraic calculations | **5** |
|  | To perform trigonometry calculations | **15** |
|  | To perform geometric calculations | **35** |
|  | To carry out mensuration calculations | **15** |
|  | To perform statistical calculations | **20** |
|  | **Total** | **100** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Apply arithmetical principles | * 1. **Whole Numbers and Fractions**      1. Identifying whole numbers      2. Understanding simple fractions      3. Operations with fractions (addition, subtraction, multiplication, division)   2. **Decimals and Percentages**      1. Understanding decimals and their applications      2. Converting between fractions, decimals, and percentages      3. Calculating percentages (discounts, increases, etc.)   3. **Place Value and Rounding**      1. Understanding place value (units, tens, hundreds, etc.)      2. Rounding off numbers (to nearest whole number, tenths, etc.)   4. **Arithmetic Percentages and Proportions**      1. Understanding ratios and proportions      2. Solving problems involving percentages   5. **Decimal and Standard Form**      1. Expressing numbers in decimal form      2. Converting numbers to standard form (scientific notation) | 1. Practical 2. Projects 3. Portfolio of evidence 4. Third party reports 5. Written tests |
| 1. Perform Algebraic calculations | * 1. **Indices**      1. Understanding the concept of indices (exponents)      2. Performing calculations with indices   2. **Linear Equations**      1. Representing linear equations in various forms (slope-intercept, standard)      2. Solving linear equations   3. **Using Scientific Calculators**      1. Familiarization with the scientific calculator      2. Solving mathematical problems as per the manufacturer’s manual   4. **Simultaneous Equations**      1. Understanding simultaneous equations      2. Methods for solving simultaneous equations (substitution, elimination)   5. **Algebraic Equation**      1. Solving simple algebraic equations      2. Formulating simple algebraic equations based on word problems | * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |
| 1. Perform Trigonometry calculations | * 1. **Trigonometric Rules**      1. Identifying key trigonometric rules (sine, cosine, tangent)      2. Understanding right-angle triangles   2. **Applying Trigonometric Rules**      1. Using trigonometric ratios to find unknown sides/angles      2. Solving real-world problems using trigonometry   3. **Performing Trigonometric Calculations**      1. Calculating values using trigonometric functions      2. Application of the sine, cosine, and tangent function | * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |
| 1. Perform geometric calculations | * 1. **Identifying Geometric Figure**      1. Recognizing different geometric shapes (triangles, circles, polygons)      2. Understanding properties of geometric figures   2. **Calculating Areas**      1. Area formulas for various figures (rectangle, triangle, circle, etc.)      2. Applying formulas to calculate areas   3. **Pythagoras’ Theorem**      1. Understanding the Pythagorean theorem      2. Solving problems using the theorem | * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |
| 1. Carry out Mensuration calculations | * 1. **Units of Measurement**      1. Identifying different units of measurement (length, area, volume)      2. Understanding the significance of units in calculations   2. **Unit Conversion**      1. Converting units (e.g., centimeters to meters, square feet to square meters)      2. Application of conversion in problems   3. **Perimeters and Areas**      1. Calculating perimeters of geometric figures      2. Area calculations using correct formulas   4. **Volume and Surface Area**      1. Formulas for volume and surface area of solids (cylinder, cube, sphere)      2. Solving volume and surface area problems   5. **Area of Irregular Figures**      1. Techniques for calculating areas of irregular shapes      2. Using decomposition methods for area calculation | * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |
| 1. Perform statistical calculations | * 1. **Data Identification**      1. Understanding grouped vs. ungrouped data      2. Characteristics of different data types   2. **Organizing Data**      1. Techniques for organizing ungrouped data      2. Using frequency tables to represent data   3. **Calculating the Median**      1. Understanding median in data sets      2. Calculating the median for both grouped and ungrouped data   4. **Data Representation**      1. Representing data in chart form (bar charts, histograms, pie charts)      2. Interpreting data from visual representations | * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |
| 1. Apply linear graphs | * 1. **Identifying Information**      1. Understanding given data sets and problems      2. Extracting relevant information for graphing   2. **Choosing Appropriate Scale**      1. Selecting appropriate scales for graphs      2. Understanding the impact of scale on graph interpretation   3. **Labeling Axes**      1. Properly labeling graph axes      2. Understanding the significance of labels in data representation   4. **Plotting Linear Graphs**      1. Techniques for plotting linear graphs      2. Connecting points and interpreting lines   5. **Graph Analysis**      1. Analysing trends and patterns from plotted graphs      2. Drawing conclusions based on graph data | * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |

**Suggested Methods of Instruction**

1. Role playing
2. Viewing of related videos
3. Discussion
4. Direct Instruction
5. Practicals
6. Projects

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Mathematical table | For trainee’s use | 25 pcs | 1:1 |
|  | Mathematical set | For trainee’ use | 25 pcs | 1:1 |
|  | SMP Table | For trainee’ use | 25 pcs | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Assorted color of whiteboard markers | For trainee’s use | 10 pcs | 10:1 |
| **D** | **Tools and Equipment** | | | |
|  | Rulers, protractors and compasses, | For trainee’s use | 25pcs | 1:1 |
|  | Scientific Calculator | For trainee’s use | 25pcs | 1:1 |

## WORKSHOP TECHNOLOGY SKILLS

**UNIT CODE: 0732 451 10A**

**UNIT DURATION: 50 Hours**

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Demonstrate Workshop Technology Skill

**Unit Description**

This unit describes the competencies required to demonstrate workshop technology skills. It involves demonstrating workshop safety awareness, demonstrating masonry skills, demonstrating carpentry skills, performing electrical operations and managing workshop waste.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | To demonstrate workshop safety awareness | **4** |
|  | To demonstrate masonry skills | 15 |
|  | To demonstrate carpentry skills | **15** |
|  | To perform electrical operations | **10** |
|  | To manage workshop waste | **6** |
|  | **TOTAL** | **50** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Demonstrate workshop safety awareness | * 1. Personal Protective Equipment:      1. Dust coat/overall      2. Safety boots      3. Helmet      4. Safety gloves      5. Safety goggles      6. Reflector jackets      7. Hear muffs      8. Face musk   2. Personal safety rules and regulations (Occupational Safety and Health (OSH) Act 2012);      1. Proper Usage of PPE      2. PPE Maintenance      3. Incident Reporting      4. Roles and Responsibilities   3. Workshop machine, tools and equipment safety procedures (Occupational Safety and Health (OSH) Act 2012);      1. Proper Use of Machines and Tools      2. Inspection and Maintenance      3. Safety Guards and Devices      4. Safe Handling and Storage      5. Training and Awareness   4. Workplace safety practices (Occupational Safety and Health (OSH) Act 2012);      1. Hazard Identification:      2. Safe Work Practices      3. Training and Awareness      4. Safety Signage and Communication      5. Incident Reporting and Investigation   5. Appropriate fire extinguishers:      1. Identify the Extinguisher Class:      2. Operating the Fire Extinguisher (PASS Technique)      3. Fire Extinguisher Location and Accessibility      4. Training and Awareness | * Observation * Written Tests * Oral Questioning * Portfolio of evidence * Third Party Report   Interviews |
| 1. Demonstrate masonry skills | * 1. Workshop safety hazards:      1. Fire      2. Explosion      3. Fumes and gases      4. Electric shock      5. Spilt oil/water   2. Masonry tools, equipment and consumable materials: Fabrication tools and equipment      1. Wire brush      2. Saws      3. Hammers      4. Trowels      5. Mason square      6. Builder’s line      7. Tape measure      8. Floats      9. shovel      10. Levels      11. Plumb bob      12. Drilling machines      13. Wheel barrows   3. Working drawings:      1. structural      2. architectural      3. mechanical      4. electrical   4. Setting out      1. Understanding Design Plans      2. Surveying and Measurement      3. Marking and Layout      4. Verification and Adjustment   5. Masonry procedures:      1. Understanding Job Specifications      2. Preparation of Materials and site      3. Setting Out and Layout      4. Laying Masonry Units      5. Building Up Layers (Courses)      6. Curing Process   6. Masonry works finishes:      1. Review Job Specifications      2. Surface Preparation      3. Finishing Techniques      4. Curing Process   7. Masonry works tests:      1. Understanding Testing Requirements      2. Types of Tests for Masonry Works      3. Visual Inspection      4. Structural Stability Tests      5. Corrective Actions | * Observation * Written Tests * Oral Questioning * Portfolio of evidence * Third Party Report   Interviews |
| 1. Demonstrate carpentry skills | * 1. Workshop safety hazards:      1. Fire      2. Explosion      3. Fumes and gases      4. Electric shock      5. Spilt oil/water      6. Carpentry tools, equipment:         1. planes         2. saws         3. chisels         4. clamps         5. vices         6. gauges         7. files         8. drills         9. screw drivers         10. spanners   2. Consumable materials:      1. Blocks      2. Adhesives      3. Sand paper      4. Electric cables      5. Conduits      6. Patress      7. Couplers      8. Switches      9. bulbs      10. Switch boxes      11. Stones      12. Sand      13. Cement      14. Timber      15. Lime      16. Hoop iron      17. Reinforcement bars      18. Jointing cement      19. Clips      20. Sheet metal      21. nails   3. Working drawings      1. Structural      2. Architectural      3. Mechanical      4. Electrical   4. Setting out:      1. Review Design Plans and Specifications      2. Preparation for Setting Out      3. Measurement and Marking      4. Alignment and Checking      5. Setting Out Joinery Components   5. Carpentry procedures:      1. Review Job Specifications      2. Preparation and Planning      3. Site Assessment      4. Setting Out      5. Cutting and Shaping Materials      6. Assembly and Installation      7. Finishing Touches | * Observation * Written Tests * Oral Questioning * Portfolio of evidence * Third Party Report * Interviews |
| 1. Perform electrical operations | * 1. Safety requirements in the workshop environment as per OSHA 2012:      1. Workplace assessment      2. Personal Protective Equipment (PPE)      3. Personal Protective Equipment (PPE)      4. Safe Work Practices      5. Tool Safety      6. Training and Competence   2. Working drawings:      1. Architectural      2. Mechanical      3. Electrical   3. Electrical tools, equipment and consumable materials:      1. Pliers      2. Tester      3. Draw wire      4. Bending spring      5. Electric meters      6. Ladder      7. Drilling machine      8. Screw drivers      9. Hammer   4. Power supply source      1. Assessment of Power Needs      2. Selection of Power Supply Sources      3. Installation and Setup      4. Testing Power Sources   5. IEE regulations on Basic electrical circuits installation and maintenance:      1. Familiarization with IEE Regulations.      2. Planning the Installation      3. Installation Procedures      4. Testing Electrical Circuits      5. Circuit Protection | * Observation * Written Tests * Oral Questioning * Portfolio of evidence * Third Party Report * Interviews |
| 1. Manage workshop waste | |  | | --- | | * 1. PPEs:      1. Dust coat      2. Helmet      3. Gloves   2. Waste management tools and equipment: Dust bin      1. Shovel      2. Brooms      3. Dust blower      4. Dust pan      5. Wheel barrow      6. trowel   3. Waste collection as per environmental management authority guidelines:      1. Understanding Environmental Management Authority Guidelines      2. Developing a Waste Management Plan      3. Implementing Waste Segregation      4. Establishing Collection Procedures      5. Handling Hazardous Waste      6. Training and Awareness Programs   4. Solid waste disposal as per NEMA guidelines:      1. Understanding NEMA Guidelines      2. Waste Management Plan      3. Waste Segregation      4. Waste Segregation      5. Waste Segregation   5. Waste management procedures      1. Reduce      2. Recycle      3. reuse | | * Observation * Written Tests * Oral Questioning * Portfolio of evidence * Third Party Report * Interviews |

**Suggested Methods of Instruction**

1. Practical
2. Role playing
3. Demonstrations
4. Viewing of related videos
5. Group Discussion
6. Projects
7. Direct Instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Workshop technology reference books | For both trainer & trainee’s use | 14 | 1:2 |
|  | Working drawings: Structural, architectural, mechanical & electrical drawings | For trainee’s use | 25 pcs | 1:1 |
|  | Building Drawings samples | For both trainer’s and trainee’ use | 25 pcs | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | Carpentry workshop having carpentry tools and equipment | 8m by 14m | 1 | 1:25 |
|  | Electrical workshop with electrical tools and equipment. | 8m by 14m | 1 | 1:25 |
|  | Masonry workshop with masonry tools and equipment. | 8m by 14m | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Whiteboard marker pens | For trainee’s use | 10 pcs | 10:1 |
|  | Masking Tape | For trainee’s use | 1pc | 25:1 |
|  | Drawing stationery | For trainee’s use | 25 pcs per stationery | 1:1 |
| **D** | **Tools and Equipment** | | | |
|  | Masonry tools & equipment | For trainee’s use | Sufficient | 1:1 |
|  | Carpentry tools & equipment | For trainee’s use | Sufficient | 1:1 |
|  | Carpentry tools & equipment | For trainee’s use | Sufficient | 1:1 |

## ENTREPRENEURIAL SKILLS

**UNIT CODE: 0413 441 11A**

**Relationship to occupational standards**

This unit addresses the unit of competency: Apply Entrepreneurial skills.

**Duration of unit:** 40 hours

**Unit Description:**

This unit covers the competencies required to demonstrate an understanding of entrepreneurship. It involves demonstrating an understanding of financial literacy, applying entrepreneurial concepts identifying entrepreneurship opportunities, applying business legal aspects, and developing business innovative strategies and business plans.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Apply financial literacy | **6** |
|  | Apply the entrepreneurial concept | **4** |
|  | Identify entrepreneurship opportunities | **6** |
|  | Apply business legal aspects | **6** |
|  | Innovate Business Strategies | **6** |
|  | Develop a business plan | **12** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply financial literacy | * 1. Personal finance management   2. Balancing between needs and wants   3. Budget Preparation   4. Saving management   5. Factors to consider when deciding where to save   6. Debt management   7. Factors to consider before taking a loan   8. Investment decisions   9. Types of investments   10. Factors to consider when investing money   11. Insurance services   12. insurance products available in the market   13. Insurable risks. | * Observation * Project * Written assessment * Oral assessment * Third party report * Interviews |
| 2.Apply entrepreneurial concept | * 1. Difference between Entrepreneurs and Business persons   2. Types of entrepreneurs   3. Ways of becoming an entrepreneur   4. Characteristics of Entrepreneurs   5. salaried employment and self-employment   6. Requirements for entry into self-employment   7. Roles of an Entrepreneur in an enterprise   8. Contributions of Entrepreneurship | * Observation * Project * Written assessment * Oral assessment * Third party report |
| 3.Identify entrepreneurship opportunities | * 1. Sources of business ideas   2. Factors to consider when evaluating business opportunity   3. Business life cycle | * Observation * Project * Written assessment * Oral assessment * Third party report |
| 4.Apply business legal aspects | * 1. Forms of business ownership   2. Business registration and licensing processing   3. Types of contracts and agreements   4. Employment laws   5. Taxation laws | * Observation * Project * Written assessment * Oral assessment * Third party report |
| 5.Innovate business Strategies | * 1. Creativity in business   2. Innovative business strategies   3. Entrepreneurial Linkages   4. ICT in business growth and development | * Observation * Project * Written assessment * Oral assessment * Third party report |
| 6.Develop Business Plan | * 1. Business description   2. Marketing plan   3. Organizational/Management   4. plan   5. Production/operation plan   6. Financial plan   7. Executive summary   8. Business plan presentation   9. Business idea incubation | * Observation * Written assessment * Project * Oral assessment * Third party report |

**Suggested Methods of Instruction**

* Direct instruction with active learning strategies
* Project (Business plan)
* Case studies
* Field trips
* Group Discussions
* Demonstration
* Question and answer
* Problem solving
* Experiential
* Team training
* Guest speakers

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** |  |  |  |
| 1 | Textbooks | Recommended publisher | 8 | 1:3 |
| 2 | Business plan templates | Recommended format | 25 | 1:1 |
| 3 | Internet connection | Reliable | - | - |
| 4 | White board | For trainer’s use | 1 | - |
| 5 | Case studies | Recommended formats | 5 | 1:5 |
| 6 | Video clips | Sufficient | - | - |
| 7 | Business journals | Recommended publisher | 5 | 1:5 |
| 8 | Newspapers and hand-outs | Recommended publisher | 5 | 1:5 |
| **B** | **Learning Facilities & infrastructure** |  |  |  |
|  | Lecture/theory room | 72 Square Meter | 1 | 1:25 |
|  | Computer Lab | 96 Square Meter | 1 | 1:25 |
| **C** | **Consumable materials** |  |  |  |
|  | Ink | Assorted Colours for trainer’s use | 500ml per term | - |
|  | White board Marker | Refillable type | 10 pcs per term | - |
|  | Printing papers | sufficient | - | - |
|  | Writing materials | sufficient | 25 | 1:1 |
| **D** | **Tools and Equipment** |  |  |  |
| 1 | Computers | Latest version | 10 | 1:3 |
| 2 | Projector | Latest version | 1 | 1:25 |
| 3 | External storage media | Latest version | 25 | 1:1 |
| 4 | Mobile phones | Latest version | 25 | 1:1 |
| 5 | Printers | Latest version | 2 | 1:13 |

## ROAD CONSTRUCTION WORKS I

**UNIT CODE: 0732 451 12A**

**UNIT DURATION:** 110Hours

**Relationship to Occupational Standards**

This unit addresses the competencies required in carry out pavement construction works.

**Unit Description**

This unit describes the competencies required in carry out pavement construction works. It involves Carrying out Earthwork Activities, constructing pavement layers, constructing transportation infrastructure and applying emerging trends in road construction.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/NO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Carry out earthwork activities | **20** |
|  | Construct pavement layers | **20** |
|  | Construct transportation infrastructure | **20** |
|  | To apply emerging trends in road construction | **10** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Carry out earthwork activities | * 1. Earthwork resources      1. Plants and equipment’s      2. Overview of earthmoving equipment      3. Equipment maintenance and safety checks   2. Site clearance      1. Activities including Tree felling and stump removal, Boulders removal, Bush clearing      2. Importance of site clearance before construction      3. Waste management during site clearance   3. Drawings interpretation      1. Types of construction drawings      2. Reading and understanding symbols and legends      3. Key dimensions and specifications      4. Identifying critical details)   4. Setting out for earthworks      1. Definition and importance of setting out      2. Tools and equipment used      3. Techniques for accurate marking   5. Ground levels      1. Importance of understanding ground levels in earthworks      2. Techniques for measuring and recording ground levels   6. Volumes of cut and fill      1. Definition of cut and fill in earthworks      2. Methods for calculating volumes      3. Importance of balance between cut and fill   7. Disposal of waste      1. Types of waste generated in earthwork      2. Regulations and guidelines for waste disposal      3. Recycling and reuse options for excavated materials   8. Construction tools and equipment      1. Overview of common construction tools      2. Hand tools and their uses      3. Power tools and safety considerations | 1.practical  2.Projects  3.Portfolio of evidence  4.Third party reports  5. Written tests |
| 1. Construct pavement layers | * 1. Road construction resources      1. Materials resources      2. Labor and workforce management      3. Equipment and machinery   2. Drawings interpretation      1. Types of construction drawings      2. Symbols and abbreviations used      3. Scale and measurement   3. Levelling activities      1. Types of leveling      2. Instruments used in levelling activities   4. **Profile layers** including Sub grade, Subbase, Base course, binder, Wearing course      1. Definitions and functions of each layer      2. Material specifications and selection      3. Construction techniques for each layer   5. Maintenance of road structure      1. Types of road maintenance      2. Inspection techniques and frequency      3. Common road defects and their remedies   6. Construction tools and equipment      1. Types of tools      2. Heavy machinery      3. Safety equipment and practices      4. Equipment maintenance and operation | 1.practical  2.Projects  3.Portfolio of evidence  4.Third party reports  5. Written tests |
| 1. Construct transportation infrastructure | * 1. Resources      1. Material sourcing and procurement      2. Human resources management   2. Drawings      1. Types of engineering drawings      2. Reading and interpreting construction symbols   3. **Transportation infrastructure** including parking, walk ways, cyclist lanes, foot bridges, bus bays      1. Design principles for parking facilities      2. Walkway design standards and accessibility      3. Cycle lane planning and integration      4. Footbridge design considerations      5. Bus bay layout and traffic flow management   4. Leveling activities      1. Equipment and tools for levelling      2. Techniques for different terrain types      3. Establishing control points and benchmarks   5. Quality control operations      1. Quality assurance vs. quality control      2. Inspection methods and tool      3. Compliance with industry standards and regulation   6. Transportation infrastructure maintenance      1. Types of maintenance      2. Inspection protocols and techniques      3. Common maintenance challenges and solutions | * 1. Practical   2. Projects   3. Portfolio of evidence   4. Third party reports   5. Written tests |
| 1. Apply emerging strategies for Road maintenance | * 1. Emerging trends:      1. Self-healing concrete in roads      2. Recycled plastic admixtures      3. Prefabricated plastic roads      4. BIM      5. Solar roads      6. Do-Nou technology      7. Cobbles   2. Road construction site:      1. Sustainable Practices      2. Automated Construction Processes      3. Advanced Technology      4. Enhanced Safety Measures   3. Road construction works:      1. Sustainable Construction Practices      2. Automated and Semi-Automated Equipment      3. Circular Economy Practices      4. Resilient Infrastructure Design | Practical  Projects  Portfolio of evidence  Third party report  Written tests |

**Suggested Methods of Instruction**

1. Role playing
2. Viewing of related videos
3. Discussion
4. Direct Instruction
5. Practicals
6. Projects

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Structural drawings & Site layout | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Calculator | For trainee’s use | 25 pcs | 1:1 |
|  | Construction designs and drawings | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Sample contract documents | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | AutoCAD | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | ArchiCAD | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Civil3D | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Schedule of work | For trainee’s use | 25no | 1:1 |
|  | Standard manuals | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Contract documents | For both trainer’s and trainee’ use | 25no | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | 45site | For both trainer’s and trainee’ use | 1 | 1:25 |
|  | Material testing laboratory | For both trainer’s and trainee’ use | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Dust | For trainee’s use | sufficient | 1:1 |
|  | Cement | For trainee’ use | 5 pcs | 1:5 |
|  | concrete | For trainee’ use | sufficient | 1:1 |
|  | Bitumen | For trainee’s use | sufficient | 1:1 |
|  | Timber | For trainee’s use | sufficient | 1:1 |
|  | Gravel | For trainee’s use | sufficient | 1:1 |
|  | Soil | For trainee’s use | sufficient | 1:1 |
| **D** | **Tools and Equipment** | | | |
|  | Concrete mixer | For trainee’s use | 5no | 1:5 |
|  | Welding machines | For trainers and trainee’s use | 5no | 1:5 |
|  | Concrete vibrator | For trainers and trainee’s use | 5no | 1:5 |
|  | Tape measures, | For trainee’s use | 5no | 1:5 |
|  | rulers | For trainee’s use | 5no | 1:5 |
|  | plumb bobs | For trainee’s use | 5no | 1:5 |
|  | Dumpy level | For trainers and trainee’s use | 5no | 1:5 |
|  | Molds | For trainers and trainee’s use | 5no | 1:5 |
|  | Tamping rods | For trainers and trainee’s use | 5no | 1:5 |
|  | CBR Machines | For trainers and trainee’s use | 1no | 1:25 |
|  | Crushing machines | For trainers and trainee’s use | 1no | 1:25 |
|  | saws | For trainee’s use | 5no | 1:5 |

# MODULE FOUR

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Unit Duration (Hours)** | **Credit** |
| 0732 451 09A | PREPARE FOR MATERIALS TESTING II | 50 | 5 |
| 0732 451 12A | EXECUTE ROAD MAINTAINANCE WORKS | 60 | 6 |
| 0732 451 12A | EXECUTE ROAD CONSTRUCTION WORKS I | 110 | 11 |
| 0732 451 14A | CARRY OUT CIVIL WORKS | 100 | 10 |

## MATERIAL TESTING I

**UNIT CODE: 0732 451 13A**

**UNIT DURATION:** 50Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Conduct Material Testing

**Unit Description**

This unit specifies the competencies required to Conduct Material Testing. It involves performing soil tests and performing concrete tests.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/NO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | Perform soil tests | **30** |
|  | Perform concrete tests | **20** |

|  |  |  |
| --- | --- | --- |
| **Learning outcomes** | **Content** | **Suggested methods of assessment** |
| 1. Perform soil tests | * 1. Soils tests Identification      1. Standard manuals and procedures      2. Soil testing tools and apparatus.      3. Obtaining soil samples      4. Soil Tests   2. Soil Classification Tests      1. Waterberg Limits Test      2. Grain Size Distribution (Sieve Analysis)      3. Hydrometer Analysis   3. Compaction Tests      1. Standard Proctor Test      2. Modified Proctor Test   4. Shear Strength Tests      1. Direct Shear Test      2. Triaxial Compression Test   5. Permeability Tests      1. Constant Head Test      2. Falling Head Test   6. Consolidation Tests      1. Odometer Test   7. Compaction Characteristics Tests      1. California Bearing Ratio (CBR) Test      2. Unconfined Compression Test   8. Moisture Content Tests      1. Oven Drying Method      2. Rapid Moisture Content Test  |  | | --- | | * 1. Results analysis and Reports preparation   2. Maintenance of soils tests equipment | | 1. Written tests 2. Observation 3. Oral question 4. Third party |
| 1. Perform concrete tests | * 1. Concrete Tests  |  | | --- | | * + 1. **Workability Tests**     2. **Slump Test**     3. **Vebe Test**     4. **Flow Table Test**     5. **Strength Tests**     6. **Compressive Strength Test (Cube and Cylinder Tests)**     7. **Flexural Strength Test**     8. **Split Tensile Strength Test**     9. **Durability Tests**     10. **Rapid Chloride Permeability Test**     11. **Water Absorption Test**     12. Sulphate Resistance Test     13. Density and Specific Gravity Tests     14. Unit Weight Test     15. Specific Gravity Test     16. Non-Destructive Testing     17. Rebound Hammer Test     18. Ultrasonic Pulse Velocity Test     19. Penetration Resistance Test   1. Concrete testing tools   2. Concrete material tests.   3. Aggregates tests   4. **Physical Properties Tests**      1. Sieve Analysis (Grain Size Distribution)      2. Specific Gravity and Absorption      3. Bulk Density Test      4. Voids and Porosity Test   **2.6. Mechanical Properties Tests**   * + 1. Aggregate Crushing Value (ACV) Test     2. Aggregate Impact Value (AIV) Test     3. Los Angeles Abrasion Test     4. Ten Percent Fines Value (TPFV) Test   1. **Soundness Tests**      1. Sodium Sulphate Soundness Test      2. Magnesium Sulphate Soundness Test   2. **Chemical Properties Tests**      1. Organic Impurities Test      2. Alkali-Silica Reactivity Test   3. **Moisture Content Tests**      1. Moisture Content Test (Oven Drying Method)   4. **4.4.6 Shape and Texture Tests**      1. Flakiness and Elongation Index Test      2. Shape Index Test   5. Cement tests      1. Fineness Tests      2. Sieve Test      3. Air Permeability Test (Blaine's Test)      4. Consistency and Setting Time Tests      5. Vicat Needle Test      6. Initial and Final Setting Time Test   6. Le Chatelier's Soundness Test   7. Chemical **Properties Tests**      1. pH Test      2. Loss on Ignition Test      3. Sulphur Trioxide Content Test   8. **Heat of Hydration Tests**   2.14.1 Heat of Hydration Test (Calorimetric Method)   * 1. **Density and Specific Gravity Tests**   2.15.1 Specific Gravity Test (Pycnometer Method)   * 1. **Expansion and Soundness Tests**   2. **Le Chatelier Test (for soundness)**   3. **Autoclave Expansion Test**   4. **Concrete curing methods**   5. **Tests analysis and reporting**   6. **Maintain concrete testing equipment** | | 1. Written tests 2. Observation 3. Oral question 4. Third party |

**Suggested Methods of Instruction**

* Practical
* Projects
* Demonstration
* Group discussion
* Direct instructions
* Site visit

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Rolls Flip Charts | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Rulers, protractors and compasses, set-squares | For trainer’s use | 2 pcs each | 2:1 |
|  | projectors | For trainer’s use | 1 pc | 1:25 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | Technical Drawing room | 9m by 8m | 1 | 1:25 |
|  | Training room | 9m by 8m | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Assorted color of whiteboard markers | For trainee’s use | 10 pcs | 10:1 |
|  | Grain size distribution charts | For trainee’ use | 2 pcs each | 2:1 |
|  | Masking Tape | For trainee’s use | 1pc | 25:1 |
|  | Drawing stationery | For trainee’s use | 25 pcs per stationery | 1:1 |
| **D** | **Tools and Equipment** | | | |
|  | Technical Drawing Instruments | For trainee’s use | 25 pcs | 1:1 |
|  | Drawing Board | For trainee’s use | 25 pcs | 1:1 |
|  | Soil Testing Equipment | For trainer and trainee use | 8 pcs | 3:1 |
|  | Concrete Testing Equipment | For trainer and trainee use | 8 pcs | 3:1 |

## ROAD MAINTENANCE WORKS

**UNIT CODE: 0732 451 14A**

**UNIT DURATION: 60 Hours**

**Relationship to Occupational Standards**

This unit addresses the competencies required in Execute Road Maintenance Works

**Unit Description**

This unit describes the competencies required in execute road maintenance works. It involves preparing for road maintenance works, executing right of way maintenance, executing Road Furniture maintenance Works and applying emerging strategies for Road maintenance.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **SNO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | To prepare for road maintenance works | **10** |
|  | To executing right of way maintenance, | **20** |
|  | To executing road furniture maintenance works | **20** |
|  | To applying emerging strategies for road maintenance. | **10** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Prepare for road maintenance works | * 1. Road condition survey      1. Failures in roads.   2. Road maintenance work plan      1. Objectives and scope of the maintenance plan      2. Scheduling and prioritization of task      3. Resource allocation including labour, materials, equipment.   3. Road maintenance desktop study      1. Purpose and methodology of a desktop study      2. Data collection sources      3. Assessment of road conditions and maintenance history      4. Identification of maintenance needs and priorities   4. Road systems maintenance tools, equipment, materials and supplies      1. Common tools used in road maintenance      2. Equipment for specific tasks      3. Types of materials used      4. Inventory management and procurement processes      5. Maintenance and care of tools and equipment   5. Safety kits identification and assembly      1. Components of a road maintenance safety kit      2. Importance of safety equipment | 1.practical  2.Projects  3.Portfolio of evidence  4.Third party reports  5. Written tests |
| 1. Execute right of way maintenance | * 1. Safety precautions application 2.1.1 Overview of safety regulations and standards      1. Personal protective equipment (PPE) requirements      2. Hazard identification and risk assessment      3. Emergency procedures and response plans   2. Road’s maintenance resources      1. Human resource,      2. Plant and equipment resources   3. Existing services      1. Identification of underground utilities      2. Methods for locating existing services      3. Risks associated with working near utilities      4. Securing Road maintenance site      5. Importance of site security      6. Barricading and signage requirements      7. Traffic management strategies during maintenance   4. Road systems maintenance      1. Routine maintenance tasks      2. Assessment and monitoring of road conditions      3. Long-term maintenance planning   5. Maintenance work quality assurance      1. Definition and importance of quality assurance (QA)      2. QA processes and protocols      3. Documentation and reporting standards   6. Road maintenance environment reinstatement      1. Overview of environmental considerations in road maintenance      2. Techniques for restoring disturbed areas      3. Compliance with environmental regulation | 1.Practical  2.Projects  3.Portfolio Of Evidence  4.Third Party Reports  5. Written Tests |
| 1. Execute Road Furniture maintenance Works | * 1. Safety Precaution      1. Review of safety measures      2. Importance of following OEM manuals   2. Condition Survey of Road Furniture      1. Conducting a survey      2. Evaluating the condition of furniture   3. Mobilizing Maintenance Resources      1. Planning and organizing resources      2. Effective allocation based on needs   4. Site Security for Furniture Maintenance      1. Ensuring site safety during maintenance   5. Maintenance Procedures for Road Furniture      1. Steps for proper maintenance      2. Quality assurance practices   6. Environmental Reinstatement      1. Importance of reinstating the environment      2. Best practices in maintaining environmental standards | 1.practical  2.Projects  3.Portfolio of evidence  4.Third party reports  5.Written tests |
| 1. Apply emerging strategies for Road maintenance | * 1. Safety Measures      1. Review of OSH Act and safety protocols   2. Preparation for Maintenance Works      1. Developing maintenance schedules      2. Effective planning strategies   3. Execution of Maintenance Works      1. Implementing job schedules      2. Monitoring progress and quality   4. Completion Activities      1. Standard specifications for completion      2. Importance of thorough final checks   5. Environmental Conservation Measures      1. Overview of EMCA (Cap 387)      2. Strategies for environmental conservation in road maintenance |  |

**Suggested Methods of Instruction**

* Role playing
* Viewing of related videos
* Discussion
* Direct Instruction
* Practicals
* Projects

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Structural drawings & Site layout | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Calculator | For trainee’s use | 25 pcs | 1:1 |
|  | Construction designs and drawings | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Sample contract documents | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | AutoCAD | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | ArchiCAD | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Civil3D | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Schedule of work | For trainee’s use | 25no | 1:1 |
|  | Standard manuals | For both trainer’s and trainee’ use | 25no | 1:1 |
|  | Contract documents | For both trainer’s and trainee’ use | 25no | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
|  | 45site | For both trainer’s and trainee’ use | 1 | 1:25 |
|  | Material testing laboratory | For both trainer’s and trainee’ use | 1 | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Asphalt | For trainee’s use | sufficient | 1:1 |
|  | Concrete | For trainee’ use | sufficient | 1:5 |
|  | Bitumen: k160,mc30,mc70 | For both trainer’s and trainee’ use | sufficient | 1:1 |
|  | Reflectors | For both trainer’s and trainee’ use | 25pc | 1:1 |
|  | Warning tapes | For trainee’s use | sufficient | 1:1 |
| **D** | **Tools and Equipment** | | | |
|  | Paver | For trainers and trainee’s use | 1no | 1:25 |
|  | Wheelbarrow | For trainee’s use | 5no | 1:5 |
|  | Roller | For trainers and trainee’s use | 1no | 1:25 |
|  | Core cutter machine | For trainers and trainee’s use | 1no | 1:25 |
|  | Hand sprayer | For trainers and trainee’s use | 1no | 1:25 |
|  | Crushing machines | For trainers and trainee’s use | 1no | 1:25 |
|  | Chips spreader | For trainers and trainee’s use | 1no | 1:25 |

## CIVIL WORKS

**UNIT CODE: 0732 451 15A**

**UNIT DURATION:** 100 Hours

**Relationship to Occupational Standards**

This unit addresses the Unit of Competency: Carry out Civil Works

**Unit Description**

This unit describes the competencies required in carry out civil works. It involves carrying out site preliminary work, performing civil temporary works, executing substructure works

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/NO** | **LEARNING OUTCOMES** | **DURATION (hours)** |
|  | To carry out site preliminary works | **20** |
|  | To perform civil temporary works | 40 |
|  | To execute substructure works | **40** |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Carry out site preliminary works | * 1. Site survey:      1. Use of surveying equipment      2. Topographical survey      3. Geotechnical investigation   2. Site boundary:      1. Boundary identification      2. Surveying techniques      3. Marking and fencing   3. Site clearance:      1. Adherence to standard procedures      2. Removal of vegetation      3. Debris and obstacle removal      4. Soil and topsoil management      5. Site layout:      6. Adherence to construction standards for site layout      7. Use of surveying tools      8. Marking Reference Points      9. Setting Out Structures and Features   4. Site preliminary report      1. Site survey findings      2. Geotechnical assessment      3. Environmental impact analysis      4. Utility and infrastructure assessment      5. Site clearance and preparation status   5. Site utilities:      1. Temporary washrooms      2. Source of water      3. Storage      4. Site office | * Practical * Projects * Portfolio of evidence * Written tests |
| 1. Perform civil temporary works | * 1. Trench timbering:      1. Site assessment      2. selection of timbering materials      3. Construction of trench timbering      4. Installation of protective systems      5. Monitoring and inspection      6. Safe dismantling procedures   2. Formwork/shuttering construction and dismantling:      1. Types of formwork materials      2. Design and installation      3. Reinforcement integration      4. Safety considerations      5. Concrete pouring and curing      6. Stripping or dismantling of formwork   3. Scaffold erection and dismantling:      1. Adherence to job requirements      2. Scaffold design and planning      3. Erection of scaffold      4. Dismantling of scaffold      5. Inspection and maintenance   4. Shores erection and dismantling:      1. Need based on job requirement.      2. Shore design and planning      3. Erection of shores      4. Safety precautions | * Practical * Projects * Portfolio of evidence * Written tests |
| 1. Execute substructure works | 1. Types of Foundation:    * 1. Strip footing      2. Pad footing      3. Raft    1. Setting out       1. Understanding project requirements       2. Site preparation       3. Surveying equipment       4. Marking layout:       5. Alignment and levels:    2. Excavation of foundation:       1. Setting Out the Excavation Area       2. Excavation Process; depth and width, slope stability, & handling excavated material:       3. Dealing with Groundwater    3. Laying of foundation       1. Foundation type       2. Reinforcement placement       3. Concrete pouring:    4. Structural elements:       1. Column,       2. Beam,       3. Staircase, &       4. Slab. | * Practical * Projects * Portfolio of evidence * Written tests |

**Suggested Methods of Instruction**

1. Practical
2. Role playing
3. Demonstrations
4. Viewing of related videos
5. Group Discussion
6. Projects
7. Direct Instruction

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning Materials** | | | |
|  | Structural drawings & Site layout | For both trainer’s and trainee’ use | 5 pcs | 1:5 |
|  | Calculator | For trainee’s use | 25 pcs | 1:1 |
| **B** | **Learning Facilities & infrastructure** | | | |
|  | Whiteboards | For trainer’s use | 1 pc | 1:25 |
|  | Chalkboard | For trainer’s use | 1 pc | 1:25 |
| **C** | **Consumable materials** | | | |
|  | Assorted color of whiteboard markers | For trainee’s use | 10 pcs | 10:1 |
|  | Steel reinforcements | For trainee’ use | 5 pcs | 1:5 |
|  | concrete | For trainee’ use | 1MT | 1:5 |
|  | Pegs | For trainee’s use | 25pcs | 1:1 |
|  | Timber | For trainee’s use | 25fts | 1:1 |
| **D** | **Tools and Equipment** | | | |
|  | Rulers, protractors and compasses, | For trainers and trainee’s use | 25pcs | 1:1 |
|  | Surveying equipment: dumpy level total station etc. | For trainers and trainee’s use | 5 no | 1:5 |
|  | Scientific Calculator | For trainers and trainee’s use | 25pcs | 1:1 |
|  | Scaffold | For trainee’s use | 5pcs | 1:5 |
|  | Bar bender | For trainee’s use | 5pcs | 1:5 |
|  | Hacksaw | For trainee’s use | 5pcs | 1:5 |
|  | Bar cutter | For trainee’s use | 5pcs | 1:5 |
|  | Measuring tape | For trainee’s use | 5pcs | 1:5 |
|  | Builder’s line | For trainee’s use | 5pc s | 1:5 |
|  | Jembe | For trainee’s use | 5pc s | 1:5 |
|  | Spade | For trainee’s use | 5pc s | 1:5 |
|  | Wheelbarrow | For trainee’s use | 5pc s | 1:5 |