

**REPUBLIC OF KENYA**

**COMPETENCY BASED MODULAR CURRICULUM**

**FOR**

**AUTOBODY TECHNOLOGY**

**KNQF LEVEL 5**

**PROGRAMME CODE: 0716 454A**

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# FOREWORD

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

Reforms in the education sector are necessary to achieve Kenya Vision 2030 and meet the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution, and this resulted in the formulation of the Policy Framework for Reforming Education and Training in Kenya (Sessional Paper No. 14 of 2012). A key feature of this policy is the radical change in the design and delivery of TVET training. This policy document requires that training in TVET be competency-based, curriculum development be industry-led, certification be based on demonstration of competence, and the mode of delivery allow for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this curriculum has been developed. For trainees to build their skills on foundational hands-on activities of the occupation, units of learning are grouped in modules. This has eliminated duplication of content and streamlined exemptions based on skills acquired as a trainee progresses in the up-skilling process, while at the same time allowing trainees to be employable in the shortest time possible through the acquisition of part qualifications.

It is my conviction that this curriculum will play a great role in developing competent human resources for the Automotive Engineering Sector’s growth and 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.

# ACKNOWLEDGMENT

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 Engineering and Manufacturing 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 Automotive Engineering 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 Automotive Engineering Sector acquire competencies to perform their work more efficiently and effectively.

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# ACRONYMS

TVETA Technical and Vocational Education Training Authority

NEMA National Environmental Management Authority

OSHA Occupational Health and Safety Act

ICT Information and Communication Technology

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

TVET Technical and Vocational Education and Training

RAM Random Access Memory

CPU Central processing Unit

HDMI High-Definition multimedia interface

ICT Information and communication technology

USB Universal Serial Bus

PPE Personal Protective Equipment

# KEY TO UNIT CODE



# COURSE OVERVIEW

The Auto Body Level 5 curriculum consists of competencies that a person must achieve to enable him/her to service, maintain motor vehicles in the motor vehicle industry. It includes vehicle glass components installation, vehicle body repaired, glass components maintenance and glazing finishing processes.

The units of competency comprising Auto Body Level 5 qualifications include the following competencies:

# SUMMARY OF UNITS OF LEARNING

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Unit Title** | **Unit Duration (Hours)** | **Credit** |
| **MODULE I** | | | |
| 0716 251 01A | Vehicle structure welding | 90 | 9 |
| 0716 251 02A | Vehicle body repair | 90 | 9 |
| 0716 251 03A | Vehicle Fibre Works | 90 | 9 |
| **MODULE II** | | | |
| 0716 351 04A | Vehicle Body Surface Preparation | 90 | 9 |
| 0716 351 05A | Vehicle Spray Painting | 120 | 12.0 |
| 0716 351 06A | Vehicle body valeting | 90 | 90 |
| **MODULE III** | | | |
| 0031 441 07A | Communication skills | 40 | 4.0 |
| 0417 441 08A | Work ethics and practices | 40 | 5.0 |
| 0541 441 09A | Applied Mathematics | 80 | 8.0 |
| 0732 451 10A | Technical drawing | 80 | 12.0 |
| 0716 451 11A | Vehicle Glass Components Installation | 140 | 14.0 |
| 0716 451 12A | Glazing finishing processes | 140 | 14.0 |
| **MODULE IV** | | | |
| 0611 451 13A | Digital literacy | 40 | 8.0 |
| 0413 441 14A | Entrepreneurial skills | 40 | 6.0 |
| 0715 451 15A | Workshop Technology | 80 | 8.0 |
| 0715 441 16A | Mechanical science | 80 | 8.0 |
| 0713 441 17A | Electronics and Control Principles | 80 | 8.0 |
| 0716 451 18A | Glass components maintenance | 140 | 14.0 |
|  | Industrial Attachment | 480 | 48 |
| **GRAND TOTAL** | | **2030** | **203** |

**Entry Requirements**

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

1. Kenya certificate of secondary education (KCSE) with a minimum of D plain.

Or

1. A KNQF level 4 qualification certificate in Auto body technology or its equivalent.

**Trainer qualification**

A trainer for any of the units of competency in this course must:

1. Possession of at least level 6 qualification in Vehicle Auto Body or its equivalent in Vehicle Auto Body.
2. Be registered by TVETA.
3. Be registered by Engineer Board of Kenya (E.B.K) or Kenya Engineering Technology Registration Board (KETRB).

**Industry Training**

An individual enrolled in this course will be required to undergo Industry training for a minimum period of 480 hours in Vehicle Body 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. During summative assessment basic and common units may be integrated in the core units or assessed as discrete units.
4. Theoretical and practical weight shall be as follows:
5. 10:90 for unit in module 1 and module 2 for each unit of learning.
6. 30:70 for units in module 3 and module 4 for each unit of learning.
7. Formative and summative assessments shall be weighted at 60% and 40% respectively in the overall unit of learning score
8. For a candidate to be declared competent in a unit of competency, the candidate must meet the following conditions:
9. Obtained at least 40% in theory assessment in formative and summative assessments.
10. Obtained at least 60% in practical assessment in formative and summative assessment where applicable.
11. Obtained at least 50% in the weighted results between formative assessment and summative assessment where the former constitutes 60% and the latter 40% of the overall score.
12. Assessment performance rating for each unit of competency shall be as follows:

|  |  |
| --- | --- |
| **MARKS** | **COMPETENCE RATING.** |
| 80-100 | Mastery |
| 65-79 | Proficiency. |
| 50-64 | Competent |
| 49 and below | Not yet competent. |
| Y | Assessment malpractice/Irregularities. |

**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 Autobody Technology KNQF 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.

The certificates will be issued by the Qualification Awarding Institution

**MODULE I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit Code** | **Units Title** | **Unit Duration (Hours)** | **Credit Factor** |
| 0716 251 01A | Vehicle structure welding | 120 | 12.0 |
| 0716 251 02A | Vehicle body repair | 120 | 12.0 |
| 0716 351 03A | Vehicle Fibre Works | 100 | 10.0 |

**VEHICLE STRUCTURE WELDING I**

**ISCED UNIT CODE:** 0716 251 01A

**Relationship to occupational standards**

This unit addresses the unit of competency: Weld vehicle structure.

**Duration of unit:** 90 Hours

**Unit Description:**

This unit of learning covers the learning outcomes, content, assessment methods, methods of delivery and resources required to train vehicle structure welding. This unit covers competencies required to demonstrate skills to weld vehicle structures. It involves competencies to Gas weld vehicle structure, arc weld vehicle structure and perform housekeeping.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Gas weld vehicle structure | 35 |
| 2. | Arc Weld Vehicle structure | 35 |
| 3 | Perform House Keeping | 20 |
| **Total** | | **90** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Gas weld vehicle structure | * 1. Usage of PPEs      1. Safety Glasses or Goggles      2. Overalls      3. Dust Mask      4. Welding shield      5. Welding Goggles   2. Vehicle body panel assessment      1. Cracks      2. Dents      3. rust   3. Materials, tools and equipment      1. Oxygen and Acetylene Cylinders      2. Welding Torch      3. Safety Glasses or Goggles      4. Overalls      5. Dust Mask      6. Welding shield      7. Welding Goggles   4. Types of joints      1. Spot Weld Joints      2. Seam Weld joints      3. Flanged joints      4. Adhesive bonded joints   5. Gas welding process      1. rightward welding      2. leftward welding   6. Types of flames-      1. carburizing flame      2. oxidizing flame      3. neutral   7. panel polishing      1. grinding      2. sanding | * Practical * Projects * Portfolio of evidence * Written tests |
| 1. Arc Weld Vehicle structure | * 1. Vehicle panels assessment      1. Cracks      2. Dents      3. rust   2. Materials, tools and equipment      1. Welding machine (Arc welder)      2. Electrode holder      3. Ground clamp      4. Welding electrodes      5. Welding cables      6. Welding helmet (with auto-darkening feature welding gloves      7. Welding jacket or apron      8. Safety boots      9. Welding rods      10. Wire brush      11. Chipping hammer      12. Welding table      13. Clamps   3. Types of joints      1. Spot Weld Joints      2. Seam Weld joints      3. Flanged joints      4. Adhesive Bonded Joints   4. methods of arc welding technics      1. rightward welding      2. leftward welding   5. Arc welding equipment      1. Welding machine (Arc welder)      2. Electrode holder      3. Ground clamp      4. Welding electrodes      5. Welding cables      6. Welding helmet (with auto-darkening feature   6. Welding processes   7. Weld polishing      1. Grinding      2. Filing      3. sanding | * Observation * Project * Written assessment * Oral assessment * Portfolio of evidence |
| 1. Perform House Keeping | * 1. Waste disposal and management      1. Recycling      2. Hazardous waste disposal      3. Incineration      4. Landfilling      5. Waste minimization   2. Cleaning of tools and equipment   3. Cleaning of floors | * Observation * Project * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning materials and infrastructure** | | | |
|  | Training Classes: 1 session | 8M\*20M | 1 | 1:25 |
|  | Workshops: 1 practical workshop | 18M\*12M | 1 | 1:25 |
|  | Computer with Internet connectivity |  | 1 | 1:25 |
|  | Projector for presentations |  | 1 | 1:25 |
|  | Whiteboard for collaborative learning |  | 1 | 1:25 |
|  | Textbooks | Vehicle Body Technology Textbooks | 5 pcs | 1:5 |
|  | White board | Quality whiteboard of approximately 4 ft by 8 ft for writing during theory instruction | 1 | 1:25 |
| **B** | **Tools and Equipment** | | | |
|  | Wire Brushes |  | 5 | 1:5 |
|  | Chipping Hammers |  | 5 | 1:5 |
|  | Welding Tables |  | 5 | 1:5 |
|  | Sets of Clamps |  | 10 | 1:3 |
|  | Grinding Tools |  | 10 | 1:3 |
|  | Sanding Tools |  | 2 | 1:13 |
|  | Filing Tools |  | 5 | 1:5 |
|  | Oxygen and Acetylene Cylinder Sets |  | 5 | 1:5 |
|  | Welding Machines (Arc Welders) |  | 5 | 1:5 |
|  | Welding Helmets (with auto-darkening feature) |  | 5 | 1:5 |
|  | Sets of Welding Rods |  | 10 | 1:3 |
|  | Cleaning Kits for Tools and Equipment |  | 10 | 1:3 |
|  | Floor Cleaning Kits (mops, brooms) |  | 5 | 1:5 |
| **C** | **Materials** | | | |
|  | Pairs of clear Safety Glasses or Goggles |  | 25 | 1:1 |
|  | Dust Masks |  | 25 | 1:1 |
|  | Welding Shields |  | 5 | 1:5 |
|  | Welding Goggles |  | 5 | 1:5 |
|  | Pairs of Welding Gloves |  | 2 | 1:13 |
|  | Vehicle Body Assessment Tools (for cracks, dents, rust) |  | 5 | 1:5 |
|  | Recycling Bins |  | 2 | 1:13 |
|  | Hazardous Waste Disposal Containers |  | 3 | 1:8 |

**VEHICLE BODY REPAIR**

**ISCED UNIT CODE:** 0716 251 02A

**Relationship to occupational standards**

This unit addresses the unit of competency: repair vehicle body

**Duration of unit:** 90 Hours

**Unit Description:**

This unit of learning covers the learning outcomes, content, assessment methods, methods of delivery and resources required to train repair vehicle body. This unit covers competencies required to Repair Vehicle Body. It involves competencies in performing vehicle body jacking, performing vehicle body pulling, performing vehicle body panel beating and performing workshop house keeping

**Summary of Learning Outcomes**

By the end of this unit of learning, the trainee will be able to:

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Perform vehicle body jacking | 20 |
| 2. | Perform vehicle body pulling | 30 |
| 3 | Perform vehicle body panel beating | 30 |
| 4. | Perform Workshop House Keeping | 10 |
| **Total** | | **90** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| * + - 1. Perform vehicle body jacking | * 1. Work place health and Safety      1. Personal safety      2. Workshop safety      3. Tools Safety   2. Body panel jacking   3. Operation of body jack      1. Hydraulic jack      2. Hoist      3. Pneumatic jack | * Observation * Project * Written assessment * Oral assessment |
| * + - 1. Perform vehicle body pulling | * 1. Workplace health and safety      1. Personal safety      2. Workshop safety      3. Tools safety   2. Vehicle body panels and structures      1. Door      2. Bonnet      3. boot      4. spoiler      5. floor      6. roof      7. under structure   3. vehicle body pulling tools      1. body puller | * Observation * Project * Written assessment * Oral assessment |
| * + - 1. Perform vehicle body panel beating | * 1. Vehicle body panels      1. Door      2. Bonnet      3. boot      4. spoiler      5. floor      6. roof      7. under structure   2. vehicle body panel tools      1. Dinging hammer      2. Chipping hammer      3. Soft hammer      4. Lever      5. Welding machine      6. Dollies      7. Spoons   3. Vehicle body structures      1. Door      2. Bonnet      3. Boot      4. Spoiler      5. Floor      6. Roof      7. Under structure   4. Body filler application      1. Compound filler      2. Hardener      3. Chemical paste   5. Sanding      1. Sand paper      2. File sander      3. Disc sander      4. Sanding block | * Observation * Project * Written assessment * Oral assessment |
| * + - 1. Perform Workshop House Keeping | * 1. Waste disposal and management      1. Recycling      2. Hazardous waste disposal      3. Incineration      4. Landfilling      5. Waste minimization   2. Cleaning and maintenance of tools and equipment      1. Oiling      2. Greasing   3. Storage of tools      1. Toolbox      2. Tool rack | * Observation * Project * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning materials and infrastructure** | | | |
|  | Training Classes: 1 session | 8M\*20M | 1 | 1:25 |
|  | Workshops: 1 practical workshop | 18M\*12M | 1 | 1:25 |
|  | Computer |  | 1 | 1:25 |
|  | Projector for presentations |  | 1 | 1:25 |
|  | Whiteboard for collaborative learning |  | 1 | 1:25 |
|  | Access to Internet |  | 1 | 1:25 |
|  | Textbooks | Textbooks on vehicle body | 5 pcs | **1:5** |
|  | White board | Quality whiteboard of approximately 4 ft by 8 ft for writing during theory instruction | 1 | **1:25** |
| **B** | **Tools and Equipment** | | | |
|  | Body Pullers | Suction cup type, and or spot weld | 5 | 1:5 |
|  | Dinging Hammers |  | 5 | 1:5 |
|  | Chipping Hammers |  | 5 | 1:5 |
|  | Soft Hammers |  | 5 | 1:5 |
|  | Levers |  | 5 | 1:5 |
|  | Dollies |  | 5 | 1:5 |
|  | Spoons |  | 5 | 1:5 |
|  | Tool Oiling Kits |  | 5 | 1:5 |
|  | Greasing Kits |  | 5 | 1:5 |
|  | Toolboxes |  | 3 | 1:8 |
|  | Tool Racks |  | 2 | 1.13 |
|  | Floor Cleaning Kits (mops, brooms) |  | 5 | 1:5 |
|  | Cleaning Kits for Tools and Equipment |  | 1 | 1:25 |
|  | Welding Machines |  | 2 | 1.13 |
| **C** | **Materials** | | | |
|  | Compound Filler |  | 5 | 1:5 |
|  | Hardener |  | 5 | 1:5 |
|  | Chemical Pastes |  | 10 | 1:3 |
|  | Sets of Sandpaper | various grits | 5 | 1:5 |
|  | File Sanders |  | 2 | 1.13 |
|  | Disc Sanders |  | 2 | 1.13 |
|  | Sanding Blocks |  | 10 | 1:3 |
|  | Recycling Bins |  | 2 | 1.13 |
|  | Hazardous Waste Disposal Containers |  | 3 | 1:8 |
|  | Dust Masks |  | 25 | 1:1 |
|  | Hydraulic Jacks |  | 2 | 1:13 |
|  | Hoists |  | 2 | 1:13 |
|  | Pneumatic Jacks |  | 1 | 1:25 |
|  | Safety Glasses or Goggles |  | 25 | 1:1 |

**VEHICLE FIBRE WORKS**

**ISCED UNIT CODE:** 0716 251 03A

**Relationship to occupational standards**

This unit addresses the unit of competency: perform vehicle fibre works

**Duration of unit:** 90 Hours

**Unit Description:**

This unit of learning describes the learning outcomes, content, assessment and delivery methods required in training perform vehicle fibre works. This unit covers competencies required to Perform Vehicle Fibre Works. It involves competencies in reinforcing vehicle fibre structure, repairing vehicle fibre structure and performing housekeeping.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Reinforce vehicle fibre structure | 30 |
| 2. | Repair vehicle fibre structure | 40 |
| 3 | Perform House Keeping | 20 |
| **Total** | | **90** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Reinforce vehicle fibre structure | * 1. Usage of PPEs      1. Safety Glasses or Goggles      2. Overalls      3. Dust Mask      4. Welding shield      5. Welding Goggles   2. Vehicle body panels assessment      1. Door      2. Bonnet      3. Boot      4. Spoiler      5. Roof      6. Bumper   3. Tools and equipment      1. Dinging hammer      2. Chipping hammer      3. Soft hammer      4. Lever      5. Welding machine      6. Dollies      7. Spoon   4. Fibre materials      1. Fibre glass   5. Materials tools and equipment      1. Resin      2. Hardener      3. Fiberglass mat      4. Carbon fiber fabric      5. Epoxy resin      6. Polyester resin | * Observation * Project * Written assessment * Oral assessment |
| 1. Repair vehicle fibre structure | * 1. Workplace health and safety      1. Personal safety      2. Workshop safety      3. Tools safety      4. material safety   2. Identification of vehicle fibre panels      1. Bumper      2. Hood      3. Dashboard      4. Trunk lid      5. Body panels   3. Fibre materials      1. Fibre glass      2. Resin      3. Hardener      4. Fiberglass mat      5. Carbon fiber fabric      6. Epoxy resin      7. Polyester resin   4. Fibre structure shaping      1. Moldings      2. Weaving   5. Vehicle body filler      1. Compound filler      2. Hardener      3. Chemical paste | * Observation * Project * Written assessment * Oral assessment |
| 1. Perform House Keeping | * 1. Waste disposal and management      1. Recycling      2. Hazardous waste disposal      3. Incineration      4. Landfilling      5. Waste minimization   2. Cleaning and storing of tools and equipment | * Observation * Project * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | **Recommended Ratio**  (Item: Trainee) |
| **A** | **Learning materials and infrastructure** | | | |
|  | Training Classes: 1 session | 8M\*20M | 1 | 1:25 |
|  | Workshops: 1 practical workshop | 18M\*12M | 1 | 1:25 |
|  | Computer |  | 1 | 1:25 |
|  | Projector for presentations |  | 1 | 1:25 |
|  | Whiteboard for collaborative learning |  | 1 | 1:25 |
|  | Access to Internet |  | 1 | 1:25 |
|  | Textbooks | Vehicle body Technology Textbooks | 5 pcs | 1:5 |
|  | White board | Quality whiteboard of approximately 4 ft by 8 ft for writing during theory instruction | 1 | 1:25 |
| **B** | Tools and Equipment | | | |
| 1 | Pairs of Safety Glasses or Goggles |  | 25 | 1:1 |
| 2 | Safety Goggles |  | 5 | 1:5 |
| 3 | Dinging Hammers |  | 5 | 1:5 |
|  | Chipping Hammers |  | 5 | 1:5 |
|  | Soft Hammers |  | 5 | 1:5 |
|  | Levers |  | 5 | 1:5 |
|  | Dollies |  | 5 | 1:5 |
|  | Spoons |  | 5 | 1:5 |
|  | Cleaning Kits for Tools and Equipment |  | 5 | 1:5 |
|  | Tool Storage Boxes |  | 2 | 1:13 |
|  | Tool Racks |  | 2 | 1:13 |
|  | Sets of Molding Tools |  | 2 | 1:13 |
|  | Weaving Tools |  | 5 | 1:5 |
| **C** | **Materials** | | | |
| 1 | Kits of Fiberglass (sheets or rolls) |  | 5 | 1:5 |
|  | Liter of Resin |  | 5 | 1:5 |
|  | Pieces of Hardener |  | 2 | 1:13 |
|  | Rolls of Fiberglass Mat |  | 1 | 1:25 |
|  | Rolls of Carbon Fiber Fabric |  | 1 | 1:25 |
|  | 1 liter of Epoxy Resin |  | 2 | 1:13 |
|  | 1 liter of Polyester Resin |  | 1 | 1:25 |
|  | Waste Bins for Recycling |  | 2 | 1:13 |
|  | Hazardous Waste Disposal Containers |  | 3 | 1:8 |
|  | Dust Masks |  | 25 | 1:1 |

**MODULE II**

**VEHICLE BODY SURFACE PREPARATION**

**ISCED UNIT CODE:** 0716 351 04A

**Relationship to occupational standards**

This unit addresses the unit of competency: perform vehicle body surface preparation

**Duration of unit:** 90 Hours

**Unit Description:**

This unit specifies the competencies required to prepare vehicle body surface. It involves; applying primer, applying spot putty, perform wet sanding and perform housekeeping.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Primer Application | 20 |
| 2. | Spot Putty Application | 30 |
| 3 | Wet Sanding | 30 |
| 4 | House Keeping | 10 |
| **Total** | | **90** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| * 1. Primer Application | * 1. Workplace health and safety      1. Personal safety      2. Workshop safety      3. Tools safety      4. Material safety   2. Selection of Tools, materials and equipment      1. Body surface primer      2. Assorted sand papers      3. Sander      4. Masking tape      5. Masking papers      6. Spray gun      7. Acrylic thinner      8. Air compressor      9. Hose pipes      10. Measuring cup      11. Spraying booth      12. Detergents      13. Bucket of water   3. Application of primer   4. Sanding      1. Assorted sand papers      2. Sanding discs | * Practical * Observation * Project * Written assessment * Oral assessment |
| 1. Spot Putty Application | 2.1 Inspection of Vehicle body panels   * + 1. Bonnet     2. Wing     3. Hood     4. Roof     5. Doors     6. Boot     7. Spoiler   1. Application of spot putty   2. Sanding      1. Assorted sand papers      2. sander      3. Assorted sanding discs | * Practical * Observation * Project * Written assessment * Oral assessment |
| 3. Wet Sanding | * 1. Tools materials and equipment      1. Sand paper/assorted sand papers      2. Sander      3. Detergent      4. Bucket of water   2. Drying | * Observation * Project * Practical * Written assessment * Oral assessment |
| 1. House Keeping | * 1. Waste disposal and management      1. segregation of waste   2. cleaning and storing of tools and equipment      1. dusting      2. cleaning | * practical * Observation * Project * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| --- | --- | --- | --- | --- |
| **A Learning Materials** | | | | |
| 1 | Textbooks | Comprehensive textbooks on workplace safety, tools, materials, and automotive body repair techniques | 25 | 1:1 |
| 2 | Projector | Functional projector for displaying content during presentations | 1 | 1:25 |
| 3 | Computer | Functional desktop computer with online instructional content | 1 | 1:25 |
| 4 | Whiteboard | Quality whiteboard, approximately 6 ft by 3 ft | 1 | 1:25 |
| 5 | Printer | Inkjet or laser printer for printing handouts, instructions, and diagrams | 1 | 1:25 |
| **B Learning Facilities** | | | | |
| 1 | Lecture Room | Spacious room with seating for 25 trainees, approximately 60 sqm | 1 | 1:25 |
| 2 | Workshop | Standard workshop with designated sanding, painting, and finishing areas (approx. 180 sqm) | 1 | 1:25 |
|  | Spray Painting Booth | Standard spray-painting booth | 1 | 1:25 |
| **C Safety Equipment** | | | | |
| 1 | Dust coat/overall | Shields skin and clothes from dust and paint | 25 | 1:1 |
| 2 | Gloves | Protects hands during sanding, painting, and tool handling | 25 | 1:1 |
| 3 | Safety glasses | Protects eyes from flying particles and chemicals | 25 | 1:1 |
| 4 | Respirators | Protects from inhaling harmful fumes and dust | 25 | 1:1 |
| 5 | Ear plugs/muffs | Protects against prolonged exposure to high noise levels | 25 | 1:1 |
| 6 | First Aid Kit | Fully equipped First Aid kit for accidents | 1 | 1:25 |
| **D Tools and Materials** | | | | |
| 1 | Spreaders | Used for applying and spreading filler | 10 | 2:5 |
| 2 | Mixers | For mixing fillers and hardeners | 5 | 1:5 |
| 3 | Sandpapers | Various grits (36, 40, 60, 80, 100, 120, 240, etc.) | Enough | - |
| 4 | Manual Sanders | Hand tools for sanding surfaces | 10 | 2:5 |
| 5 | Power Sanders | Electric sanders for quicker and consistent sanding | 5 | 1:5 |
| 6 | Sealants | Different types (polyurethane, silicone, acrylic, etc.) for bonding and sealing | 10 sets | 1:3 |
| 7 | Paint mixing scales | For accurate measurement of paint ratios | 5 | 1:5 |
| 8 | Spray Guns | HVLP and LVLP types for primer and paint application | 5 | 1:5 |
| 9 | Compressor Machine | To power spray painting equipment | 1 | 1:25 |
| 10 | Masking Tools | Tape, masking paper, plastic wrap | Enough | - |
| **E Consumables** | | | | |
| 1 | Automotive primer |  | 10 liters | - |
| 2 | Degreasers and solvents | For cleaning surfaces | 10 liters | - |
| 3 | Paint thinner | For cleaning spray guns and thinning paint | 5 liters | - |
| 4 | Rust inhibitors | For preventing corrosion | 5 liters | - |
| 5 | Adhesive removers | For removing adhesives | 5 liters | - |
| **F Reference Materials** | | | | |
| 1 | Training manuals | Comprehensive course materials and guides | 25 pcs | 1:1 |
| 2 | Manufacturer manuals | Detailed manuals for automotive paints and equipment | 1 | 1:25 |
| 3 | Digital presentations | Pre-prepared slides on techniques and safety protocols | 1 | 1:25 |

**VEHICLE SPRAY PAINTING**

**ISCED UNIT CODE:** 0716 351 05A

**Relationship to occupational standards**

This unit addresses the unit of competency; perform vehicle spray painting

**Duration of unit:** 120 Hours

**Unit Description:**

This unit specifies the competencies required to perform vehicle spray painting. It involves; performing vehicle paint mixing, applying vehicle body paint and performing workshop housekeeping.

The unit specifies the knowledge and attitude to perform vehicle spray painting. It involves; troubleshooting, knowledge on colour mixing, use of vehicle body workshop tools and equipment, performing workplace housekeeping procedure, time management, decision making and vehicle body principles.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Vehicle Paint Mixing | 40 |
| 2. | Vehicle Body Paint | 50 |
| 3 | Workshop House Keeping | 30 |
| **Total** | | **120** |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Vehicle Paint Mixing | * 1. Workplace health and safety      1. Personal safety      2. Workshop safety      3. Tools safety      4. material safety   2. Selection of tools, materials and equipment      1. Masking tape      2. Dust masks      3. Masking papers      4. Spray gun      5. Acrylic thinner      6. Air compressor      7. Hose pipes      8. Measuring cup      9. Spraying booth      10. Automotive paints      11. Colour code chart   3. Auto paints      1. Water based      2. Acrylic      3. Oil based   4. Colour mixing      1. Colour code chart | * Observation * Project * Written assessment * Oral assessment |
| * 1. Vehicle Body Paint | 1. Cleaning and masking    * 1. Masking tape      2. Dust masks      3. Masking papers      4. Soft material    1. Selection of tools equipment and materials       1. Spray gun       2. Air compressor       3. Hose pipe       4. Automotive paints       5. Thinner       6. Paint hardener    2. Paint mixing       1. Colours       2. Paint mixing machine       3. Colour chart    3. Spray painting elements       1. Ventilation       2. Spray booth       3. Protective gear       4. Lighting       5. Temperature and humidity control    4. Spray painting patterns       1. Horizontal stripe       2. Vertical stripe       3. Circular pattern       4. Diagonal pattern       5. Fan pattern | * Observation * Project * Written assessment * Oral assessment |
| * 1. . Workshop House Keeping | * 1. Waste disposal and management      1. segregation of waste   2. Cleaning and storing of tools and equipment      1. dusting      2. cleaning | * Observation * Project * Written assessment * Ora assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| --- | --- | --- | --- | --- |
| **ALearning Materials** | | | | |
| 1 | Textbooks | Comprehensive textbooks on workplace safety, tools, materials, and automotive body repair techniques | 25 | 1:1 |
| 2 | Projector | Functional projector for displaying content during presentations | 1 | 1:25 |
| 3 | Computer | Functional desktop computer with online instructional content | 1 | 1:25 |
| 4 | Whiteboard | Quality whiteboard, approximately 6 ft by 3 ft | 1 | 1:25 |
| 5 | Printer | Inkjet or laser printer for printing handouts, instructions, and diagrams | 1 | 1:25 |
| **BLearning Facilities** | | | | |
| 1 | Lecture Room | Spacious room with seating for 25 trainees, approximately 60 sqm | 1 | 1:25 |
| 2 | Workshop | Standard workshop with designated sanding, painting, and finishing areas (approx. 180 sqm) | 1 | 1:25 |
|  | Spray Painting Booth | Standard spray-painting booth | 1 | 1:25 |
| **CSafety Equipment** | | | | |
| 1 | Dust coat/overall | Shields skin and clothes from dust and paint | 25 | 1:1 |
| 2 | Gloves | Protects hands during sanding, painting, and tool handling | 25 | 1:1 |
| 3 | Safety glasses | Protects eyes from flying particles and chemicals | 25 | 1:1 |
| 4 | Respirators | Protects from inhaling harmful fumes and dust | 25 | 1:1 |
| 5 | Ear plugs/muffs | Protects against prolonged exposure to high noise levels | 25 | 1:1 |
| 6 | First Aid Kit | Fully equipped First Aid kit for accidents | 1 | 1:25 |
| **DTools and Materials** | | | | |
| 1 | Spreaders | Used for applying and spreading filler | 10 | 2:5 |
| 2 | Mixers | For mixing fillers and hardeners | 5 | 1:5 |
| 3 | Sandpapers | Various grits (36, 40, 60, 80, 100, 120, 240, etc.) | Enough | - |
| 4 | Manual Sanders | Hand tools for sanding surfaces | 10 | 2:5 |
| 5 | Power Sanders | Electric sanders for quicker and consistent sanding | 5 | 1:5 |
| 6 | Sealants | Different types (polyurethane, silicone, acrylic, etc.) for bonding and sealing | 10 sets | 1:3 |
| 7 | Paint mixing scales | For accurate measurement of paint ratios | 5 | 1:5 |
| 8 | Spray Guns | HVLP and LVLP types for primer and paint application | 5 | 1:5 |
| 9 | Compressor Machine | To power spray painting equipment | 1 | 1:25 |
| 10 | Masking Tools | Tape, masking paper, plastic wrap | Enough | - |
| **EConsumables** | | | | |
| 1 | Automotive paints | Different finishes (solid, metallic, pearl, matte) |  | - |
| 2 | Degreasers and solvents | For cleaning surfaces | 10 liters | - |
| 3 | Paint thinner | For cleaning spray guns and thinning paint | 5 liters | - |
| 4 | Rust inhibitors | For preventing corrosion | 5 liters | - |
| 5 | Adhesive removers | For removing adhesives | 5 liters | - |
| **FReference Materials** | | | | |
| 1 | Training manuals | Comprehensive course materials and guides | 25 pcs | 1:1 |
| 2 | Manufacturer manuals | Detailed manuals for automotive paints and equipment | 1 | 1:25 |
| 3 | Digital presentations | Pre-prepared slides on techniques and safety protocols | 1 | 1:25 |

**VEHICLE BODY VALETING**

**ISCED UNIT CODE:** 0716 351 06A

**Relationship to occupational standards**

This unit addresses the unit of competency; perform vehicle body valeting

**Duration of unit:** 90 Hours

**Unit Description:**

This unit of learning specifies the competencies required to perform vehicle body Valeting. It involves; perform vehicle body polishing, perform vehicle body buffing, and perform housekeeping.

**Summary of Learning Outcomes**

By the end of this unit of learning the trainee should be able to;

|  |  |  |
| --- | --- | --- |
| **S/No** | **Learning Outcomes** | **Duration (Hours)** |
| 1. | Vehicle Body Polishing | 35 |
| 2. | Vehicle Body Buffing | 45 |
| 3 | House Keeping | 10 |
| **Total** | | **90** |

**Learning Outcomes, Content and Suggested assessment methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Vehicle Body Polishing | * 1. Workplace health and safety      1. Personal safety      2. Workshop safety      3. Tools safety      4. Material safety   2. Selection of tools, materials and equipment      1. Polishing compound      2. Microfiber clothing      3. Polishing pads      4. Buffing pads      5. Polishing wax      6. Fine grit sandpaper   3. Polishing and waxing | * Observation * Project * Written assessment * Oral assessment * Portfolio of evidence |
| 1. Vehicle Body Buffing | * 1. Workplace health and safety      1. Personal safety      2. Workshop safety      3. Tools safety      4. material safety   2. selection of tools, materials and equipment      1. Buffing compounds      2. Buffing pads      3. Buffing machine      4. Buffing wax | * Observation * Project * Written assessment * Oral assessment * Portfolio of evidence |
| 1. House Keeping | * 1. Waste disposal and management      1. segregation of waste   2. Cleaning and storage of tools and equipment      1. dusting      2. cleaning |  |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| --- | --- | --- | --- | --- |
| 1. **Learning Materials** | | | | |
| 1 | Textbooks | Comprehensive textbooks on workplace safety, tools, materials, and automotive body repair techniques | 25 | 1:1 |
| 2 | Projector | Functional projector for displaying content during presentations | 1 | 1:25 |
| 3 | Computer | Functional desktop computer with online instructional content | 1 | 1:25 |
| 4 | Whiteboard | Quality whiteboard, approximately 6 ft by 3 ft | 1 | 1:25 |
| 5 | Printer | Inkjet or laser printer for printing handouts, instructions, and diagrams | 1 | 1:25 |
| **B Learning Facilities** | | | | |
| 1 | Lecture Room | Spacious room with seating for 25 trainees, approximately 60 sqm | 1 | 1:25 |
| 2 | Workshop | Standard workshop with designated sanding, painting, and finishing areas (approx. 180 sqm) | 1 | 1:25 |
|  | Spray Painting Booth | Standard spray-painting booth | 1 | 1:25 |
| **C Safety Equipment** | | | | |
| 1 | Dust coat/overall | Shields skin and clothes from dust and paint | 25 | 1:1 |
| 2 | Gloves | Protects hands during sanding, painting, and tool handling | 25 | 1:1 |
| 3 | Safety glasses | Protects eyes from flying particles and chemicals | 25 | 1:1 |
| 4 | Respirators | Protects from inhaling harmful fumes and dust | 25 | 1:1 |
| 5 | Ear plugs/muffs | Protects against prolonged exposure to high noise levels | 25 | 1:1 |
| 6 | First Aid Kit | Fully equipped First Aid kit for accidents | 1 | 1:25 |
| **D Tools and Materials** | | | | |
| 1 | Spreaders | Used for applying and spreading filler | 10 | 2:5 |
| 2 | Mixers | For mixing fillers and hardeners | 5 | 1:5 |
| 3 | Sandpapers | Fine grits | 50 pieces | - |
| 4 | Manual Sanders | Hand tools for sanding surfaces | 10 | 2:5 |
| 5 | Power Sanders | Electric sanders for quicker and consistent sanding | 5 | 1:5 |
| 6 | Buffing Machines | Powered | 5 | 1:5 |
| 7 | Waste bins | For housekeeping | 5 | 1:5 |
| 8 | Cleaning solvents and materials | For housekeeping | 5 sets | 1:5 |
| **E Consumables** | | | | |
| 1 | Degreasers and solvents | For cleaning surfaces | 10 liters | 1:2.5 |
| 2 | Polishing Compound | For polishing | 10 liters | 1:2.5 |
| 3 | Microfiber Cloths | For cleaning and polishing | 25 pieces | 1:1 |
| 4 | Polishing Pads | 10 sets | 10 sets | 1:2.5 |
| 5 | Polishing Wax | 10 sets | 10 liters | 1:2.5 |
| 6 | Fine Grit Sandpaper | For fine sanding | 10 packets | 1:2.5 |
| 7 | Buffing Pads | For buffing | 10 sets | 1:2.5 |
| 8 | Buffing Wax | For buffing | 10 liters | 1:2.5 |
| 9 | Buffing Compounds | For buffing | 10 liters | 1:2.5 |
| **F Reference Materials** | | | | |
| 1 | Training manuals | Comprehensive course materials and guides | 25 pcs | 1:1 |
| 2 | Manufacturer manuals | Detailed manuals for automotive paints and equipment | 1 | 1:25 |
| 3 | Digital presentations | Pre-prepared slides on techniques and safety protocols | 1 | 1:25 |

**MODULE III**

**COMMUNICATION SKILLS**

**ISCED UNIT CODE:** **0031 441 07A**

**Relationship with 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 |
|  | | 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 gestures   2. Apply body posture   3. 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      1. Facilitating resolution of issues      2. Developing action plans      3. Group organization techniques      4. Turn-taking techniques      5. Conflict resolution techniques      6. 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 30 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks | Comprehensive texts books on Communication Skills | 30 pcs | 1:1 |
|  | Mobile Phones | Smartphone for use by trainees | 30 pcs | 1:1 |
|  | Internet connection | Internet connection to aid communication between trainees |  |  |
|  | PowerPoint Presentations | For trainer’s use, covering course content and practical applications | 1 | 1:30 |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:30 |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:30 |
|  | Printer | An ink-jet, laser-jet or toner-cartridge printer for printing notes, instructions and working drawings | 1 | 1:30 |
|  | Templates | Templates for creating various documents e.g. CV, Cover Letter, minutes, reports etc. | 30 | 1:1 |
| **B** | **Learning Facilities & Infrastructure** |  |  |  |
|  | Lecture/Theory Room  /Learning Resource  Area\* | Spacious, equipped with projectors and Seats for 30 trainees, approximately 45 sqm (5 m x 9 m) | 1 | 1:30 |
|  | Computer Laboratory | Equipped with at least 30 functional computers with internet connectivity and the following software:   * + - Windows/ Linux/ Macintosh Operating System     - Microsoft Office Software     - Google Workspace Account     - Antivirus Software | 30 | 1:1 |
| **C** | **Consumable Materials** |  |  |  |
|  | Printing Papers | A4 and A3 Printing papers suitable for the task | Enough |  |
|  | Flashcards | For carrying out various activities by trainees | Enough |  |
|  | Flipcharts | Sufficient for group work activities and displaying | Enough |  |
|  | Whiteboard Marker Pens | Dry-erase markers for trainers use. Assorted colors | Enough |  |

**WORK ETHICS AND PRACTICES**

**ISCED UNIT CODE:** **0417 441 08A**

**Relationship with 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**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **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 |
|  | | 40 |

**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   6. Coping with Work Stress.   7. Assertiveness versus aggressiveness and passiveness      1. Developing and maintaining high self-esteem      2. Developing and maintaining positive self-image      3. Time management      4. Setting performance targets      5. 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      1. Individual responsibilities in a team      2. Determination of team roles and objectives      3. Team parameters and relationships      4. Benefits of teamwork      5. Qualities of a team player      6. Leading a team      7. Team performance and evaluation   3. Conflicts and conflict resolution   4. Gender and diversity mainstreaming   5. Developing Healthy workplace relationships   6. Adaptability and flexibility   7. 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      1. Assessing training needs      2. Mobilizing training resources   5. Licenses and certifications for professional growth and development   6. Pursuing personal and organizational goals   7. Managing work priorities and commitments   8. 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 30 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks | Comprehensive texts books on Work Ethics and Practices | 30 pcs | 1:1 |
|  | PowerPoint Presentations | For trainer’s use, covering course content and practical applications | 1 | 1:30 |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:30 |
|  | Media Resources | This include but are not limited to:   * Video Clips * Audio Clips * TV Sets * Radio Sets |  |  |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:30 |
| **B** | **Learning Facilities & Infrastructure** |  |  |  |
|  | Lecture/Theory Room  /Learning Resource  Area\* | Spacious, equipped with projectors and Seats for 30 trainees, approximately 45 sqm (5 m x 9 m) | 1 | 1:30 |
|  | Computer Laboratory | Equipped with at least 30 functional computers with internet connectivity and the following software:   * + - Windows/ Linux/ Macintosh Operating System     - Microsoft Office Software     - Google Workspace Account     - Antivirus Software | 30 | 1:1 |
|  |  |  |  |  |
| **C** | **Consumable Materials** |  |  |  |
|  | Printing Papers | A4 and A3 Printing papers suitable for the task | Enough |  |
|  | Flashcards | For carrying out various activities by trainees | Enough |  |
|  | Charts | Sufficient for group work activities and displaying | Enough |  |
|  | Whiteboard Marker Pens | Dry-erase markers for trainers use. Assorted colors | Enough |  |

**COMMON UNITS OF LEARNING**

**APPLIED MATHEMATICS**

**Unit Code: 0541 441 09A**

**Relationship with Occupational Standards**

This unit addresses the Unit of Competency: Apply Mathematics

**Unit Duration: 80 Hours**

**Unit Description**

This unit describes the competences required in order to Apply trigonometric functions, carrying out mensuration, Apply statistics and probability

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply algebra | 20 |
|  | Apply trigonometric functions | 20 |
|  | Carry out mensuration | 20 |
|  | Apply statistics and probability | 20 |
| TOTAL | | 80 |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| * + - 1. Apply algebra | * 1. Indices      1. Power zero      2. Negative powers      3. Fractional powers      4. Laws of indices         1. Addition         2. Subtraction         3. Division         4. Multiplication   2. BODMAS   3. Roots      1. Square roots      2. Cube roots      3. nth roots   4. Logarithms      1. Laws of Logarithms         1. Product Law         2. Quotient Law         3. Power Law   5. Use of scientific calculator      1. Power ON/OFF      2. Mode         1. Degree         2. Radian         3. Gradient         4. SD      3. Clear      4. Save      5. Shift   6. Simultaneous equations   (up to 3 equations)   * + 1. Elimination     2. Substitution     3. Reduction     4. Graphical   1. Quadratic equations      1. Factorization      2. Quadratic formula      3. Completing the square      4. Graphical | * Written tests |
| * + - 1. Apply trigonometric functions | * 1. Angles      1. Acute      2. Obtuse      3. Reflex      4. Right angle   2. Triangles      1. Isosceles      2. Equilateral      3. Right angled      4. Scalene   3. Trigonometric Ratios      1. Sine      2. Cosine      3. Tangent      4. Cosecant      5. Secant      6. Cotangent   4. Trigonometric Identities      1. Proof of identities      2. Pythagorean identities   5. Solve trigonometric equations   6. Hyperbolic functions      1. Sinh x      2. Cosh x      3. Cosech x      4. Tanh x      5. Sech x | * Written tests |
| * + - 1. Carry out mensuration | * 1. Units and symbols of measurement      1. Mass      2. Distance      3. Speed      4. Temperature      5. Time   2. Imperial and metric units      1. Conversions   3. Perimeter      1. Regular shapes   4. Area      1. Regular shapes   5. Volume      1. Regular shapes | * Written tests |
| * + - 1. Apply statistics and probability | * 1. Data presentation      1. Continuous variables         1. Histogram         2. Line      2. Discrete variable         1. Bar graph         2. Pie graph      3. Grouped data         1. Histogram         2. Bar         3. Cumulative frequency         4. ogive      4. Ungrouped data         1. Line         2. Cumulative frequency   2. Measures of central tendency      1. Mean         1. Grouped data         2. Ungrouped data      2. Mode         1. Grouped data         2. Ungrouped data      3. Medium         1. Grouped data         2. Ungrouped data   3. Measures of dispersion      1. Standard deviation         1. Grouped data         2. Ungrouped data      2. Variance         1. Grouped data         2. Ungrouped data   4. Probability      1. With replacement      2. Without replacement   5. Probability distribution functions      1. Binomial distribution      2. Poisson distribution   6. Normal distribution | * Written tests |

**Suggested Delivery Methods**

* Demonstration
* Group discussions
* Exercises
* Online materials
* Direct instructions
* Simulation

**Recommended Resources for 30 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** | | | |
|  | Textbooks | Comprehensive textbooks on Engineering Mathematics | 30 | 1:1 |
|  | Graph books | For graphical representation of solutions | 30 | 1:1 |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:30 |
|  | Computer | Functional desktop computer with online instructional content | 1 | 1:30 |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:30 |
|  | Printer | An ink-jet, laser-jet or toner-cartridge printer for printing notes, instructions and working drawings | 1 | 1:30 |
| **B** | **Learning Facilities & Infrastructure** | | | |
|  | Lecture/Theory Room | Spacious room with seats for 25 trainees, approximately 60 sqm | 1 | 1:30 |
| **C** | **Materials and Supplies** | | | |
|  | First Aid kit | Fully equipped First Aid kit for use in case of accidents | 1 | 1:30 |
| **D** | **Tools and Equipment** | | | |
|  | Set of Mathematical instruments | For constructions and measurements | 30 | 1:1 |
|  | Scientific Calculator | For Calculations | 30 | 1:1 |
|  | Firefighting extinguishers | Water, carbon dioxide and chemical powder fire extinguishers for fire fighting | 1 | 1:30 |
| **E** | **Reference Materials** | | | |
|  | Training Presentations/Slides | Digital format for shared access among trainees | 1 | 1:30 |
|  | Standard Mathematical Tables | For reference on formulae, identities, laws and principles | 30 | 1:1 |

**TECHNICAL DRAWING**

**UNIT CODE: 0732 451 10A**

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply technical drawings

**Duration of Unit:** 80 Hours

**Unit Description**

This unit covers the competences required to apply technical drawings. It involves using technical drawing tools, equipment and materials, producing plane geometry drawings, orthographic drawings of components, solid geometry drawings, isometric drawings and assembly drawings.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcomes** | **Duration (Hours)** |
|  | Use technical drawing tools, equipment and materials | 10 |
|  | Produce plane geometry drawings | 10 |
|  | Produce orthographic drawings of components | 20 |
|  | Produce solid geometry drawings | 10 |
|  | Produce Isometric drawings | 20 |
|  | Produce assembly drawings | 10 |
|  | | 80 |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Use and maintain drawing equipment and materials | * 1. Drawing equipment      1. T square      2. Set square      3. Protractor      4. Engineering drawing set   2. Drawing materials      1. Drawing papers      2. Masking tape      3. Clips      4. Drawing board      5. Clutch pencils   3. Use and maintenance of drawing equipment | * Practical Tests * Written tests |
| 1. Produce plane geometry drawings | * 1. Types of lines in drawings      1. Boarder lines      2. Faint continuous lines      3. Broken lines      4. Chain lines      5. Centre lines      6. Cutting lines   2. Construction of angles      1. Acute angles      2. Right angles      3. Reflex angles      4. Obtuse angles      5. Straight angles   3. Bisection of angles      1. Acute angles      2. Right angles      3. Reflex angles      4. Obtuse angles   4. Measurement of angles      1. Acute angles      2. Right angles      3. Reflex angles      4. Obtuse angles      5. Straight angles   5. Construction of plane geometric forms      1. Triangles      2. Quadrilaterals      3. Polygons      4. Circles and tangents   6. Construction of scales      1. Plane scales      2. Diagonal scale      3. Reducing and enlargement scales | * Practical tests * Written Tests |
| 1. Produce orthographic drawings of components | * 1. Orthographic drawings      1. First angle projection      2. Third angle projection   2. Dimensioning   3. Sectional views   4. Free hand sketches      1. Geometric forms      2. Tools      3. Equipment      4. Mechanical components | * Practical tests * Written Tests |
| 1. Produce solid geometry drawings | * 1. Sketches and drawings of patterns      1. Cylinders      2. Prisms      3. pyramids   2. solids drawings      1. Prisms      2. Cones      3. Cylinders   3. Development and interpenetrations of solids      1. cylinder to cylinder      2. cylinder to prisms      3. prism to prism   4. Different symbols and abbreviations   5. Auxiliary views and true shapes of truncated solids      1. Truncated cylinder      2. Truncated prism      3. Truncated pyramid | * Practical tests * Written Tests |
| 1. Produce isometric drawings | * 1. Isometric sketches and drawings of components   2. Isometric curves and circles   3. Oblique sketches of components | * Practical tests * Written Tests |
| 1. Produce assembly drawings | * 1. Orthographic views of assembly drawings      1. First angle projection      2. Third angle projection   2. Sectional views   3. Parts list | * Practical tests * Written Tests |

**Suggested Methods of Delivery**

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

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks | Comprehensive texts books on Technical Drawing | 25 pcs | 1:1 |
|  | PowerPoint Presentations | For trainer’s use, covering course content and practical applications | 1 | 1:25 |
|  | Working drawings | Working drawings giving a detailed overview of the task at hand |  |  |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:25 |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:25 |
| **B** | **Learning Facilities & Infrastructure** |  |  |  |
|  | Drawing Room  /Learning Resource  Area\* | Spacious, equipped with a projector and drawing tables for 25 trainees, approximately 45 sqm (5 m x 9 m) | 1 | 1:25 |
| **C** | **Consumable Materials** |  |  |  |
|  | Drawing papers | A4, A3 and A2 size drawing papers for drafting of sketches and working drawings | 1 ream | 1:25 |
|  | Drawing Pencils | For drawing   * HB * 2H/3H * 2B | Enough |  |
|  | Eraser | Dustless eraser for pencil stains | 30 |  |
|  | Masking Tape | For attaching the drawing paper to the drawing board | Enough |  |
| **D** | **Tools and Equipment** |  |  |  |
|  | Drawing Instruments | The include:   * T-squares * 30-60 degree set squares * 45 degree set square * Protractor * Compass set | 25 sets | 1:1 |
|  | Pencil Sharpener | For creating sharp pencil tips | 25 pcs | 1:1 |
|  | Drawing Tables | For drawing | 25 pcs | 1:1 |
| **E** | **Reference Materials** |  |  |  |
|  | Welding /blueprint /drawing Standards | Reference on industry standards (e.g., BS/ANSI/AWS etc) | 5 pcs | 1:5 |
|  | Multimedia Learning Modules | Videos and tutorials | 25 pcs | 1:1 |

**CORE UNITS OF LEARNING**

# VEHICLE GLASS COMPONENTS INSTALLATION

**ISCED UNIT CODE**: 0716 451 11A

Relationship to occupational standards

This unit addresses the unit of competency: **Install Vehicle Glass Components**

Duration of unit: 140 Hours

**UNIT DESCRIPTION:**

This unit of learning covers the learning outcomes, content, assessment methods, methods of delivery and resources required to train install vehicle glass components.

It involves installing vehicle glass components, preparing vehicle glass component, fitting vehicle glass components and performing housekeeping.

Summary of Learning Outcomes

By the end of this unit of learning, the trainee will be able to:

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcome** | **Duration (Hours)** |
|  | Prepare vehicle glass component | 60 |
|  | Fit vehicle glass components | 60 |
|  | Perform House Keeping | 20 |
| **Total** | | 140 |

Learning Outcomes, Content and Suggested Assessment Methods

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Prepare vehicle glass component | |  |  | | --- | --- | |  | * 1. Usage of personal protective equipment (PPE):      1. Gloves      2. Goggles      3. Dust masks   2. Tools and materials:  1. Glass cutters    * 1. Steel Wheel Cutter      2. Tungsten Carbide Wheel Cutter      3. Pistol-Grip Glass Cutter      4. Pencil-Style Glass Cutter      5. Self-Lubricating Glass Cutter      6. Circle Glass Cutter      7. Running Pliers with Cutting Attachment      8. Multi-Wheel Glass Cutter      9. Electric Diamond Cutter      10. Adhesive applicators          1. Hot Glue Gun          2. Caulking Gun          3. Spray Adhesive Applicator          4. Tape Dispenser          5. Double-Sided Tape Applicator          6. Bottle Applicator with Precision Tip          7. Adhesive Roller          8. Syringe Adhesive Dispenser          9. Glue Stick Applicator      11. Suction lifters 2. Lever-Activated Suction Lifter 3. Single-Cup Suction Lifter 4. Double-Cup Suction Lifter 5. Triple-Cup Suction Lifter 6. Pump-Action Suction Lifter    * 1. Glass panels         1. Windshields         2. Side windows         3. Rear windows         4. Roof glass         5. Specialty glass      2. Reflective components 7. Side mirrors 8. Rearview mirrors 9. Headlight reflectors    * 1. Screwdrivers and torque wrenches      2. Rubber mallets      3. Primer and bonding agents      4. Protective film      5. Calibrating devices    1. Inspection of glass sheets:   1.3.1 Checking for cracks  1.3.2 Ensuring surface clarity   * 1. Marking out dimensions:   2. Measuring and marking glass as per specifications      1. Measuring Tools      2. Measuring tape      3. straight edge rulers   1.5 Cutting and smoothing:  1.5.1 Using cutting tools for precise edges  1.5.2 Smoothing edges for safety | |  |  | | * Practical * Projects * Portfolio of evidence * Written tests |
| 1. Fit vehicle glass components | * 1. Work area organization  1. Workplace cleaning 2. Safety signs and barriers set up 3. Tools and materials arrangement    1. Tools and Materials Selection       1. Suction lifters       2. Adhesive applicators       3. Alignment tools    2. Glass components alignment. 4. Glass adjustment to vehicle body panels 5. Alignment checking    1. Seals and adhesives selection. 6. Seals and gaskets inspection 7. Adhesive choice    1. Adhesives application. 8. Cleaning and priming 9. Adhesive application    1. Glass components positioning and fitting 10. Lifting and positioning glass 11. Securing mounting points     1. Fitment testing 12. Water leakage tests | * Practical * Project * Written assessment * Oral assessment * Portfolio of evidence |
| 1. Perform House Keeping | * 1. Waste Disposal and Management.  1. Material recycling and segregation 2. Hazardous waste disposal    1. Tools and Equipment 3. Cleaning tools 4. Tools and equipment storage    1. Cleaning the workshop | * Practical * Project * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S/No. | Category/Item | Description/ Specifications | Quantity | Recommended Ratio(Item: Trainee) |
| A | Learning materials and infrastructure | | | |
|  | Training Classes: 1 session | 8M\*20M | 1 | 1:25 |
|  | Workshops: 1 practical workshop | 18M\*12M | 1 | 1:25 |
|  | Computer |  | 1 | 1:25 |
|  | Projector for presentations |  | 1 | 1:25 |
|  | Whiteboard for collaborative learning | 4 ft by 8 ft | 1 | 1:25 |
|  | Access to Internet |  |  |  |
|  | Textbooks | Textbooks on auto glazing | 5 pcs | 1:5 |
| B | Tools and Equipment | | | |
|  | Glass Cutters Set | Including various types (Steel Wheel, Tungsten Carbide, etc.) | 5 | 1:5 |
|  | Adhesive Applicators Set | Including caulking guns, precision tips | 5 | 1:5 |
|  | Suction Lifters Set | Various cup configurations | 5 | 1:5 |
|  | Screwdriver Sets | Various sizes | 5 | 1:5 |
|  | Torque Wrenches | Calibrated | 5 | 1:5 |
|  | Rubber Mallets |  | 5 | 1:5 |
|  | Measuring Tools Set | Including tapes and straight edges | 5 | 1:5 |
|  | Calibrating Devices | For ADAS systems | 2 | 1:13 |
|  | Tool Storage Systems |  | 3 | 1:8 |
|  | Alignment Tools Set |  | 5 | 1:5 |
|  | Water Testing Equipment | For leak testing | 2 | 1:13 |
|  | Cleaning Kits for Tools and Equipment |  | 10 | 1:3 |
|  | Floor Cleaning Kits (mops, brooms) |  | 5 | 1:5 |
| C | Materials | | | |
|  | Glass Panels | Practice pieces of various types | 10 | 1:3 |
|  | Primer Sets | For different glass types | 5 | 1:5 |
|  | Bonding Agents | Various types | 5 | 1:5 |
|  | Protective Films | Various sizes | 25 | 1:1 |
|  | Seals and Gaskets | Various types and sizes | 10 | 1:3 |
|  | Practice Mirrors | Side and rearview | 10 | 1:3 |
| D | Safety Equipment | | | |
|  | Safety Glasses |  | 25 | 1:1 |
|  | Work Gloves | Various sizes | 25 | 1:1 |
|  | Dust Masks |  | 25 | 1:1 |
| E | Cleaning Supplies | | | |
|  | Glass Cleaners |  | 5 | 1:5 |
|  | Surface Preparation Materials |  | 5 | 1:5 |
|  | Cleaning Cloths | Lint-free | 25 | 1:1 |
| F | Waste Management | | | |
|  | Glass Recycling Bins |  | 2 | 1:13 |
|  | Hazardous Waste Containers | For adhesives and primers | 2 | 1:13 |
|  | General Waste Bins |  | 3 | 1:8 |
|  | Glass Panels | Practice pieces of various types | 10 | 1:3 |

# GLAZING FINISHING PROCESSES

**ISCED UNIT CODE:** 0716 451 12A

**Relationship to occupational standards**

**This unit addresses the unit of competency:** Perform Glazing Finishing Processing

Duration of unit: 140 Hours

**Unit Description:**

This unit of learning covers the learning outcomes, content, assessment methods, methods of delivery and resources required to train perform glazing finishing processing. It involves competencies in clean glass surfaces, polish glass surface, install attachments and performing housekeeping.

**Summary of Learning Outcomes**

By the end of this unit of learning, the trainee will be able to:

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcome** | **Duration (Hours)** |
|  | Inspect Vehicle Glass Components | 40 |
|  | Polish glass surface | 40 |
|  | Install attachments | 40 |
|  | Perform House Keeping | 20 |
| **Total** | | 140 |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Inspect Vehicle Glass Components | * 1. Workplace preparation.  1. Cleaning and clearing 2. Tools arrangement and selection    * + 1. Microfiber cloths        2. Sponges        3. Soft-bristle brushes        4. Soft-bristle brushes      1. cleaning agents selection         1. Adhesive removers         2. Degreasers         3. Scratch-removal         4. polishing pastes         5. UV glass cleaner         6. Rain repellent solutions    1. Glass surfaces inspection and cleaning.       1. Glass examination 3. Dirt 4. Smudges 5. Residues    * 1. Cleaning agents application      2. Glass surface cleaning    1. Special contaminants removal   1.3.1 Use of specialized agents | * Practical * Project * Written assessment * Oral assessment |
| 1. Polish glass surface | 1. Work area preparation. 2. Arrange polishing tools 3. Glass polishing machines 4. Buffing pads and discs 5. Hand-held polishing blocks 6. Glass surfaces polishing. 7. Perform polishing 8. Restore clarity and smoothness. 9. Clean polished surfaces 10. Removal of residue | * Observation * Project * Written assessment * Oral assessment |
| 1. Install attachments | 1. Organize and prepare the work area. 2. Clean and clear the workspace. 3. Arrange tools and materials 4. Inspect glass mounting areas. 5. Mounting areas    * + 1. Windshields        2. Side Windows        3. Rear Windows        4. Sunroofs        5. Moonroofs        6. Rear-View Mirrors        7. Dashboard Mounts        8. Roof Mounts    1. Mounting area check       1. Dirt,       2. Misalignment       3. Damage.    2. Compatibility of attachments 6. Sensors 7. Cameras, 8. Heating elements 9. Wipers. 10. Window mechanism     1. Installation of attachments   3 5.1 Sensors  3.5.2 Cameras,  3.5.3 Heating elements  3.5.4 Wipers.  3.5.5 Window mechanism   * 1. Electrical connections testing   2. Final inspection. | * Observation * Project * Written assessment * Oral assessment |
| 1. Perform House Keeping | * 1. Waste Disposal and Management.      1. Recycling and segregating materials   2. Disposing hazardous waste   3. Tools and Equipment      1. Cleaning tools   4. Storing tools and equipment   5. Cleaning the workshop | * Observation * Project * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S/No. | Category/Item | Description/ Specifications | Quantity | Recommended Ratio  (Item: Trainee) |
| **A** | **Learning materials and infrastructure** | | | |
|  | Training Classes: 1 session | 8M\*20M | 1 | 1:25 |
| 2. | Workshops: 1 practical workshop | 18M\*12M | 1 | 1:25 |
| 3. | Computer |  | 1 | 1:25 |
| 4. | Projector for presentations |  | 1 | 1:25 |
| 5. | Whiteboard for collaborative learning | 4 ft by 8 ft | 1 | 1:25 |
| 6. | Access to Internet |  | 1 | 1:25 |
| 7. | Textbooks | Textbooks on glazing finishing | 5 pcs | 1:5 |
| **B** | **Tools and Equipment** | | | |
|  | **Cleaning Equipment** | | | |
| 1. | Professional Microfiber Cloths Set | Various sizes | 25 | 1:1 |
| 2. | Soft-bristle Brushes Set | Various sizes | 5 | 1:5 |
| 3. | Professional Sponges | Special glass cleaning | 10 | 1:3 |
|  | **Polishing Equipment** | | | |
| 1. | Glass Polishing Machines | Professional grade | 5 | 1:5 |
| 2. | Buffing Pads Set | Various grades | 10 | 1:3 |
| 3. | Hand-held Polishing Blocks |  | 10 | 1:3 |
|  | **Installation Tools** | | | |
| 1. | Sensor Calibration Tools | Professional grade | 2 | 1:13 |
| 2. | Electrical Testing Equipment | Multimeters etc. | 5 | 1:5 |
| 3. | Precision Screwdriver Sets | Various sizes | 5 | 1:5 |
|  | Measuring Tools | | | |
| 1. | Digital Multimeters | For electrical testing | 5 | 1:5 |
| **C** | **Materials** | | | |
| 1 | Cleaning Agents |  |  |  |
|  | Professional Glass Cleaners |  | 10 | 1:3 |
|  | Adhesive Removers | Professional grade | 5 | 1:5 |
|  | Degreasers |  | 5 | 1:5 |
|  | UV Glass Cleaners |  | 5 | 1:5 |
|  | Rain Repellent Solutions |  | 5 | 1:5 |
|  | **Polishing Materials** | | | |
|  | Polishing Compounds | Various grades | 10 | 1:3 |
|  | Scratch Removal Kits | Professional grade | 5 | 1:5 |
|  | Polishing Pastes | Various types | 10 | 1:3 |
|  | **Attachment Components** | | | |
| 1. | Practice Sensors | Various types | 5 | 1:5 |
| 2. | Practice Cameras | Various types | 5 | 1:5 |
| 3. | Heating Elements | For practice | 5 | 1:5 |
| 4. | Wiper Mechanisms | For practice | 5 | 1:5 |
| 5. | Window Mechanisms | For practice | 5 | 1:5 |
|  | **Safety Equipment** | | | |
| 1. | Safety Glasses | UV protected | 25 | 1:1 |
| 2. | Work Gloves | Chemical resistant | 25 | 1:1 |
| 3. | Dust Masks |  | 25 | 1:1 |
| 3. | Chemical-resistant Aprons |  | 25 | 1:1 |
|  | **Waste Management** | | | |
| 1. | Chemical Waste Containers | For cleaning agents | 2 | 1:13 |
| 2. | Recyclable Materials Bins |  | 2 | 1:13 |
| 3. | General Waste Bins |  | 3 | 1:8 |
|  | **Storage Solutions** | | | |
| 1. | Tool Cabinets | Organized storage | 3 | 1:8 |
| 2. | Chemical Storage Cabinet | Ventilated | 1 | 1:25 |
| 3. | Attachment Storage Systems |  | 2 | 1:13 |

# 

# MODULE IV

# BASIC UNITS OF LEARNING

**DIGITAL LITERACY**

**ISCED UNIT CODE:** **0611 441 13A**

**Relationship with 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 cybersecurity skills and job entry techniques, and performing jobs online.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcomes** | **Duration (Hours)** |
|  | Operate Computer Devices | 6 |
|  | Solve Tasks Using Office Suite | 14 |
|  | Manage Data and Information | 6 |
|  | Perform Online Communication and Collaborations | 4 |
|  | Apply Cybersecurity Skills | 4 |
|  | Perform Online Jobs | 4 |
|  | Apply job entry techniques. | 2 |
|  | | 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      1. Set basic options/preferences      2. Help resources      3. Use magnification/zoom tools      4. Display, hide built-in tool bar      5. Using navigation tools   5. Typing Text   6. Document editing (copy, cut, paste commands, spelling and Grammar check)   7. Document formatting      1. Formatting text      2. Formatting paragraph      3. Formatting styles      4. Alignment      5. Creating tables      6. Formatting tables   8. Graphical objects      1. Insert object (picture, drawn object)      2. Select an object      3. Edit an object      4. Format an object   9. Document Print setup      1. Page layout,      2. Margins set up      3. Orientation.   10. Word Document Printing   11. Meaning & Importance of electronic spreadsheets   12. Components of Spreadsheets   13. Application areas of spreadsheets   14. 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   15. Data Manipulation       1. Using Functions (Sum, Average, SumIF, Count, Max, Max, IF, Rank, Product, mode etc)       2. Using Formulae       3. Sorting data       4. Filtering data       5. Visual representation using charts   16. Worksheet printing   17. Electronic Presentations   18. Meaning and Importance of electronic presentations   19. Examples of Presentation Software   20. 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   21. Developing a presentation       1. Presentation views       2. Slides       3. Master slide   22. Text       1. Editing text       2. Formatting       3. Tables   23. Charts       1. Using charts       2. Organization charts   24. Graphical objects       1. Insert, manipulate       2. Drawings   25. Prepare outputs       1. Applying slide effects and transitions       2. Check and deliver          1. Spell check a presentation          2. Slide orientation          3. Slide shows, navigation   26. Print presentations (slides and handouts) | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * 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      1. Communication Services      2. Information Retrieval Services      3. File Transfer      4. World Wide Web Services      5. Web Services      6. Automatic Network Address Configuration      7. News Group      8. Ecommerce   4. Types of Internet Access Applications   5. Web browsing concepts      1. Key concepts      2. Security and safety   6. Web browsing      1. Using the web browser      2. Tools and settings      3. Clearing Cache and cookies      4. URIs      5. Bookmarks      6. Web outputs   7. Web based information      1. Search      2. Critical evaluation of information      3. Copyright, data protection   8. Downloads Management   9. Performing Digital Data Backup (Online and Offline)   10. Emerging issues in internet | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| * + 1. Perform online communication and collaboration | * 1. Netiquette principles   2. Communication concepts      1. Online communities      2. Communication tools      3. Email concepts   3. Using email      1. Sending email      2. Receiving email      3. Tools and settings      4. Organizing email   4. Digital content copyright and licenses   5. 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)   6. Preparation for online collaboration      1. Common setup features      2. Setup   7. Mobile collaboration      1. Key concepts      2. Using mobile devices      3. Applications      4. Synchronization | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| * + 1. Apply cybersecurity skills | * 1. Data protection and privacy      1. Confidentiality of data/information      2. Integrity of data/information      3. Availability of data/information   2. Internet security threats      1. Malware attacks      2. Social engineering attacks      3. Distributed denial of service (DDoS)      4. Man-in-the-middle attack (MitM)      5. Password attacks      6. IoT Attacks      7. [Phishing Attacks](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#phishing-attacks)      8. [Ransomware](https://onlinedegrees.sandiego.edu/top-cyber-security-threats/#ransomware)   3. Computer threats and crimes   4. Cybersecurity control measures      1. Physical Controls      2. Technical/Logical Controls (Passwords, PINs, Biometrics)      3. Operational Controls   5. Laws governing protection of ICT in Kenya      1. The Computer Misuse and Cybercrimes Act No. 5 of 2018      2. The Data Protection Act No. 24 Of 2019 | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| * + 1. Perform Online Jobs | * 1. Introduction to online working   2. Types of online Jobs   3. Online job platforms      1. Remotask      2. Data annotation tech      3. Cloud worker      4. Upwork      5. Oneforma      6. Appen   4. Online account and profile management   5. Identifying online jobs/job bidding   6. Online digital identity   7. Executing online tasks   8. Management of online payment accounts. | * Observation * Portfolio of Evidence * Project * Written assessment * Practical assessment * Oral assessment |
| * + 1. Apply job entry techniques | * 1. Types of job opportunities      1. Self-employment      2. Service provision      3. product development      4. salaried employment         1. Sources of job opportunities   2. Resume/curriculum vitae      1. What is a CV      2. How long should a CV be      3. What to include in a CV      4. Format of CV      5. How to write a good CV      6. Don’ts of writing a CV   3. Job application letter      1. What to include      2. Addressing a cover letter      3. Signing off a cover letter   4. Portfolio of Evidence      1. Academic credentials      2. Letters of commendations      3. Certification of participations      4. Awards and decorations   5. Interview skills      1. Listening skills      2. Grooming      3. Language command      4. Articulation of issues      5. Body language      6. Time management      7. Honesty   6. Generally knowledgeable in current affairs and technical area | * + Observation   + Oral assessment   + Portfolio of evidence   + Third party report * 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 30 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks | Comprehensive texts books on Digital Literacy | 30 pcs | 1:1 |
|  | Installation Manuals | Detailed guides for equipment and software installation and troubleshooting | 5 pcs | 1:5 |
|  | PowerPoint Presentations | For trainer’s use, covering course content and practical applications | 1 | 1:30 |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:30 |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:30 |
|  | Printer | An ink-jet, laser-jet or toner-cartridge printer for printing notes, instructions and working drawings | 1 | 1:30 |
|  | Templates | Templates for creating various documents e.g. CV, Cover Letter, etc. | 30 | 1:1 |
| **B** | **Learning Facilities & Infrastructure** |  |  |  |
|  | Lecture/Theory Room  /Learning Resource  Area\* | Spacious, equipped with projectors and Seats for 30 trainees, approximately 45 sqm (5 m x 9 m) | 1 | 1:30 |
|  | Computer Laboratory | Equipped with at least 30 functional computers with internet connectivity and the following software:   * + - Windows/ Linux/ Macintosh Operating System     - Microsoft Office Software     - Google Workspace Account     - Antivirus Software | 30 | 1:1 |
| **C** | **Consumable Materials** |  |  |  |
|  | Printing Papers | A4 and A3 Printing papers suitable for the task | Enough |  |
|  | Whiteboard Marker Pens | Dry-erase markers for trainers use. Assorted colors | Enough |  |
|  | Storage devices | Any of the following storage devices:   * USB Flash Drive * USB Hard Drive * Compact Disks (CDs) * Digital Versatile Disks (DVDs) | Enough |  |

**ENTREPRENEURIAL SKILLS**

**ISCED UNIT CODE: 0413 441 14A**

**Relationship with 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**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **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 business plan | 12 |
| TOTAL | | 40 |

**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 |
| 1. 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 |
| 1. 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 |
| 1. 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 |
| 1. 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 |
| 1. 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 30 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** |  |  |  |
|  | Textbooks | Comprehensive texts books on Entrepreneurial Skills | 30 pcs | 1:1 |
|  | PowerPoint Presentations | For trainer’s use, covering course content and practical applications | 1 | 1:30 |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:30 |
|  | Media Resources | These include but are not limited to:   * Video Clips * Audio Clips * TV Sets * Radio Sets * Newspapers * Business Journals * Case studies |  |  |
|  | Templates | Templates for creating various documents e.g. business plan, invoices etc. | 30 | 1:1 |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:30 |
| **B** | **Learning Facilities & Infrastructure** |  |  |  |
|  | Lecture/Theory Room  /Learning Resource  Area\* | Spacious, equipped with projectors and Seats for 30 trainees, approximately 45 sqm (5 m x 9 m) | 1 | 1:30 |
|  | Computer Laboratory | Equipped with at least 15 functional computers with internet connectivity and the following software:   * + - Windows/ Linux/ Macintosh Operating System     - Microsoft Office Software     - Google Workspace Account     - Antivirus Software | 1 | 1:1 |
| **C** | **Consumable Materials** |  |  |  |
|  | Writing Materials | Writing materials for note taking | Enough |  |
|  | Flashcards | For carrying out various activities by trainees | Enough |  |
|  | Charts | Sufficient for group work activities and displaying | Enough |  |
|  | Whiteboard Marker Pens | Dry-erase markers for trainers use. Assorted colours | Enough |  |

**COMMON UNITS OF LEARNING**

**WORKSHOP TECHNOLOGY**

**UNIT CODE: 0715 451 15A**

**Relationship with Occupational Standards:**

This unit addresses the unit of competency: Apply workshop technology

**Duration of Unit:** 80 Hours

**Unit description**

This unit describes the competencies required by a technician in order to apply workshop practice in their work. It includes applying workshop safety, material science principles and workshop tools and equipment. It also includes performing material preservation and house keeping

**Summary of Learning Outcome**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply workshop safety | 10 |
|  | Apply material science principles | 10 |
|  | Apply workshop tools and equipment | 30 |
|  | Perform material preservation | 20 |
|  | Perform housekeeping | 10 |
|  | | 80 |

**Learning Outcomes, Content and suggested assessment methods**

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Apply workshop safety | * 1. Workshop safety      1. Definition      2. Types and uses of PPE’s   2. Emergence responses steps      1. Common emergencies         1. Fire         2. Chemical spills         3. Injury response   3. Fire safety      1. Fire extinguishers types and uses      2. Flammable materials identification      3. Fire prevention   4. Safe handling and disposal of chemicals and materials      1. Chemical hazard identification      2. Safe handling procedure      3. Storage and labelling of chemicals      4. Chemical disposal procedures      5. Emergency response for chemical exposure   5. Identifying and marking hazardous zones      1. Common hazardous zones         1. Flammable zones         2. High traffic zones         3. Electrical hazard zones         4. Chemical storage areas   6. Work area organization and maintenance      1. Setting up      2. Proper storage and labelling of tools and equipment   7. Workplace hazards and risks      1. Physical hazards         1. Noises         2. Vibration         3. Heat         4. Sharp object      2. Chemical hazards         1. Fuels         2. Oils         3. Cleaning agents      3. Electric hazards         1. Live wires         2. Batteries         3. Electrical systems   8. Workshop accidents, causes and responses      1. Slip, strips and falls      2. Cuts and abrasion      3. Burns      4. Electrical shocks | * Written tests. * Practical * Project * Portfolio of evidence * Third party report |
| 1. Apply material science principles | * 1. Material science principles      1. Definition      2. Importance of material science in engineering   2. Engineering materials Classification and characteristics      1. Metals      2. Polymers      3. Ceramics   3. Properties of engineering materials      1. Mechanical properties         1. Strength         2. Hardness         3. Toughness         4. Malleability         5. Ductility         6. Rigidity      2. Thermal properties         1. Specific heat         2. Thermal expansion      3. Chemical properties         1. Corrosion resistance      4. Electrical properties         1. Electrical conductivity         2. Insulation properties   4. Material selection for engineering materials      1. Factors to consider   5. Material handling safety      1. Handling metals and alloys      2. Chemical and fuels      3. Safety measures for plastics and composites      4. Electrical safety and conductive materials | * Practical * Project * Portfolio of evidence * Third party report * Written tests. |
| 1. Apply Workshop tools and equipment | * 1. Tools and equipment safety and maintenance practices      1. Inspection      2. Safe handling techniques   2. Technical drawing interpretation      1. Purpose of assembly drawing      2. Bill of quantity      3. Assembly instructions   3. Workshop tools and equipment uses and maintenance      1. Measuring tools         1. Tape measure         2. Callipers         3. Micrometer         4. Protractor         5. Spirit level         6. Dial indicator         7. Torque wrench      2. Marking out tools         1. Scriber         2. Marking gauge         3. Combination square      3. Cutting tools         1. Hacksaw         2. Chisel         3. Files         4. Scissors      4. Fitting tools         1. Wrenches         2. Sockets         3. Pliers         4. Hammers         5. Punch         6. Tap and die      5. Forging tools         1. Anvil         2. Hammers         3. Tongs         4. Swage block      6. Sheet metal tools         1. Shears         2. Tin snips         3. Rivet gun         4. Vise      7. Workshop machine         1. Grinding machine         2. Arc welding machine         3. Gas welding machine         4. Drilling machine | * Written tests * Practical * Project * Portfolio of evidence * Third party report |
| 1. Perform material preservation | * 1. Material preservation      1. Definition of material preservation      2. Importances of material preservation      3. Storage techniques   2. Common preservation methods      1. Protective coatings      2. Chemical treatments      3. Physical barriers      4. Controlled storage conditions      5. Proper handling techniques      6. Cleaning and maintenance   3. Material preservation procedure      1. Work requirements assessment      2. Selection of appropriate preservation method | * Practical * Project * Portfolio of evidence * Third party report * Written tests. |
| 1. Perform housekeeping | * 1. Housekeeping      1. Definition      2. Importances of housekeeping   2. Housekeeping activities and their importances      1. Tool and equipment organization      2. Work area cleanliness      3. Safe handling and disposal of hazardous materials      4. Inspection and maintenance of equipment      5. Personal protective equipment management      6. Air and ventilation maintenance      7. Incident prevention and reporting   3. Housekeeping tools and equipment      1. Uses and maintenance         1. Brooms and brushes         2. Dustpans and squeegees         3. Vacuum cleaners         4. Mops and mop buckets         5. Waste bins and recycling containers   4. Housekeeping materials      1. Cleaning cloths and rags      2. Cleaning agents and solvents      3. Lubricants      4. Gloves and PPE’s      5. Disposable bags and liners   5. Workshop waste sorting and disposal      1. Types of waste         1. General waste         2. Hazardous waste         3. Recyclable waste         4. Organic waste         5. e-waste      2. Waste sorting procedure         1. Designated bins for different types of waste         2. Sorting by material         3. Pre-sorting hazardous waste      3. Hazardous waste disposal         1. Chemical waste         2. Used oil and solvents         3. Paints and finishes | * Practical * Project * Portfolio of evidence * Third party report * Written tests. |

**Suggested Delivery Methods**

* Demonstration
* Discussions
* Practical
* Industrials visits
* Simulation

**List of Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** |
|  | Textbooks | Comprehensive textbooks on workshop technology | 25 | 1:1 |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:25 |
|  | Computer | Functional desktop computer with online instructional content | 1 | 1:25 |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:25 |
|  | Printer | An ink-jet, laser-jet or toner-cartridge printer for printing notes, instructions and working drawings | 1 | 1:25 |
| **B** | **Learning Facilities & Infrastructure** |
|  | Lecture/Theory Room | Spacious room with seats for 25 trainees, approximately 60 sqm | 1 | 1:25 |
|  | Workshop | Standard workshop with bench/fitting area and welding booths approximately 80 sqm | 1 | 1:25 |
| **C** | **Materials and Supplies** |
|  | Dust coat/ overall | Shields skin and regular clothes from sparks | 25 | 1: |
|  | Gloves | Shields hands from sharp edges, heat, and chemical exposure | 25 | 1:1 |
|  | Safety boots | Protects feet from heavy objects, sharp materials, and impact. | 25 | 1:1 |
|  | Welding helmets | Protecting the eyes while providing a clear view of the weld. | 25 | 1:1 |
|  | Ear muffs/ ear plugs | Shields against prolonged exposure to high noise levels from machinery | 25 | 1:1 |
|  | Safety goggles | Protects eyes from flying metal particles, sparks, and dust | 25 | 1:1 |
|  | Raw materials | Steel and aluminum  Plates   * 4mm thickness. * 6 mm thickness.   Pipes   * 4 mm thickness * 6 mm thickness | enough |  |
|  | Arc welding electrodes | Electrodes used in Arc welding | 20 packets |  |
|  | First Aid kit | Fully equipped First Aid kit for use in case of accidents | 1 | 1:25 |
|  | Brooms and cleaning stuff | Hand brooms and mops for cleaning | 10 | 2:5 |
|  | Cotton waste | Absorbent cotton waste for cleaning of oils and other dirt on machines, tools and equipment | Enough |  |
|  | Cleaning detergents | General degreasers | 10 liters |  |
| Floor detergents | 10 liters |
| Hand detergents | 10 liters |
| **D** | **Tools and Equipment** |
| **Measuring tools** | | | | |
|  | Steel rules | Calibrated steel rules for linear measurements | 20 | 4:5 |
|  | Vernier calipers | Calibrated vernier calipers for linear measurements | 20 | 4:5 |
|  | Tri squares | Properly aligned steel Tri-square for checking perpendicular edges | 5 | 1:5 |
|  | Vernier height gauge and surface plates | Calibrated vernier height gauges and surface plates for measurement of heights | 5 | 1:5 |
|  | Measuring tapes | Calibrated measuring tapes for linear measurements | 20 | 4:5 |
|  | Angle gauges | Calibrated steel rules for linear measurements | 5 | 1:5 |
| **Marking out tools** | | | | |
|  | Scribers | steel pencil scribers for marking out lines on metal surfaces | 20 | 4:5 |
|  | Dot punches | Steel dot punches for marking out centres | 20 | 4:5 |
|  | Calipers | Quality steel calipers for marking out arcs on metal surfaces | 5 | 1:5 |
| **Cutting Tools** | | | | |
|  | Assorted hand files | Flat and round hand files for material preparation and finishing | 20 | 4:5 |
|  | Hacksaws | Hack saws with functional frames and blades for cutting metal plates and pipes | 20 | 4:5 |
|  | Tinsnips |  | 10 | 2:5 |
|  | Angle grinders | Portable angle grinders with cutting and grinding disks for cutting and grinding metal plates and pipes | 5 | 1:5 |
| **Work holding tools** | | | | |
|  | Work benches | Stable work benches for carrying out bench work | 5 | 1:5 |
|  | Collet | Hold the tungsten electrode in place | 5 | 1:5 |
|  | Bench vices | Functional bench vices/clamps for holding work pieces during bench work | 20 | 4:5 |
|  | Tongs | Functional pairs of tongs for holding hot pieces of metal during welding | 10 | 2:5 |
| **Finishing tools** | | | | |
|  | Wire brushes | To clean metal surfaces | 20 | 4:5 |
|  | File cards | Cleaning tool used to maintain files | 5 | 1:5 |
| **E** | **Machines and Equipment** |
|  | Arc welding machine | For welding operations | 5 | 1:5 |
|  | Gas welding machine | For welding operations | 5 | 1:5 |
|  | Firefighting equipment | for ensuring safety in workshops where fire hazards are present, such as sparks | 3 |  |
|  | Welding gun | Feeds the filler wire into the weld pool | 5 | 1:5 |
|  | Drilling machine | For drilling operations | 5 | 1:5 |
| **F** | **Reference Materials** |
| 1 | Working drawings |  |  |  |
| 2 | Operation sheets/ templates |  |  |  |
| 3 | Welding Procedure Specifications (WPS) |  | 25 pcs | 1:1 |
| 4 | Training Presentations/Slides | Digital format for shared access among trainees | 1 | 1:25 |
| 6 | Practical Assessment Guides | Worksheets for practical assessments | 25 pcs | 1:1 |

**MECHANICAL SCIENCE**

**UNIT CODE: 0715 441 17A**

**Relationship with Occupational Standards**: Apply Mechanical Science

**Duration of Unit**: **80 Hours**

**Unit Description**

This unit describes the competences required in order to apply mechanical science. It includes resolving forces, determining effects of loads in mechanical systems, analysing properties of materials, determining the nature of friction in mechanical systems and solving problems related to motion.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcomes** | **Duration (Hours)** |
|  | Resolve forces | 10 |
|  | Determine effects of loads in mechanical systems. | 20 |
|  | Analyze properties of materials. | 10 |
|  | Determine the nature of friction in mechanical systems | 20 |
|  | Solve problems related to motion. | 20 |
|  | | 80 |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Resolve forces | * 1. Definition of force   2. Types of force systems      1. Colinear      2. Coplanar      3. Concurrent   3. Theorems of forces      1. Triangle      2. Parallelogram      3. Polygon   4. Resolution of forces      1. Analysis      2. Graphical Method | * Written Tests * Portfolio of Evidence |
| 1. Determine effects of loads in mechanical systems. | * 1. Types of Forces      1. Friction      2. Centrifugal      3. Centripetal      4. Gravitational      5. Inertia   2. Moments      1. Definition      2. Calculations of moment of force about an axis   3. Principles of Moments      1. Clockwise and anticlockwise moments   4. Application of Moments of Forces in Engineering      1. Simply supported beams having point loads   5. Determination of moment couples      1. Simply supported beams with couples | * Written Tests * Portfolio of Evidence |
| 1. Analyze properties of materials | * 1. Mechanical Properties of Materials:      1. Strength (Compressive, Shear. And Tensile)      2. Brittleness      3. Hardness      4. Malleability      5. Plasticity      6. Elasticity      7. Toughness   2. Mechanical Materials Properties Tests      1. Tensile Test      2. Hardness Test   3. Direct Stresses      1. Define Stress      2. Types of Stress:         1. Tensile stress         2. Compressive stress      3. Calculate Stress   4. Selection of Materials      1. Factors to Consider in Materials Selection | * Written Tests * Portfolio of Evidence |
| 1. Determine the nature of friction in mechanical systems | * 1. Friction      1. Definition      2. Advantages and disadvantages of friction   2. Laws of Friction:      1. Laws of static friction      2. Laws of dynamic friction   3. Effects of Friction   4. Applications of Friction      1. Lubrication      2. Tyre Traction      3. Braking Systems      4. Bearing and Bushings      5. Grinding of Tools      6. Transmission Systems | * Written Tests * Portfolio of Evidence |
| 1. Solve problems related to motion. | * 1. Definition of terms      1. Distance      2. Displacement      3. Time      4. Speed      5. Velocity      6. Acceleration   2. Laws of Motion      1. Newton’s First Law of Motion      2. Newton’s Second Law of Motion      3. Newton’s Third Law of Motion   3. Calculating Parameters of Motion      1. Equations of linear and angular motion      2. Calculations         1. Displacement         2. Speed         3. Velocity         4. Acceleration   4. Linear and Angular Motion      1. Converting         1. Angular to Linear Motion         2. Linear to angular motion   5. Motion Graphs      1. Displacement/Time Graphs      2. Velocity/Time Graphs | * Written Tests * Portfolio of Evidence |

**Suggested Delivery Methods**

* Group discussions
* Demonstration by the trainer
* Online video clips
* Power point presentation

**Recommended Resources for 30 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** | | | |
|  | Textbooks | Comprehensive textbooks on Engineering science | 30 | 1:1 |
|  | Graph books | For graphical representation of solutions | 30 | 1:1 |
|  | Projector | Functional projector for displaying content during presentations | 1 | 1:30 |
|  | Computer | Functional desktop computer with online instructional content | 1 | 1:30 |
|  | White board | Quality whiteboard of approximately 6 ft by 3 ft for writing during theory instruction | 1 | 1:30 |
|  | Printer | An ink-jet, laser-jet or toner-cartridge printer for printing notes, instructions and working drawings | 1 | 1:30 |
| **B** | **Learning Facilities & Infrastructure** | | | |
|  | Lecture/Theory Room | Spacious room with seats for 25 trainees, approximately 60 sqm | 1 | 1:30 |
| **C** | **Materials and Supplies** | | | |
|  | First Aid kit | Fully equipped First Aid kit for use in case of accidents | 1 | 1:30 |
| **D** | **Tools and Equipment** | | | |
|  | Scientific Calculator | For Calculations | 30 | 1:1 |
| **E** | **Reference Materials** | | | |
|  | Training Presentations/Slides | Digital format for shared access among trainees | 1 | 1:30 |
|  | Standard Mathematical Tables | For reference on formulae, identities, laws and principles | 30 | 1:1 |

**ELECTRICAL AND ELECTRONICS PRINCIPLES**

**UNIT CODE:** **0713 441 18A**

**Relationship with Occupational Standards**

This unit addresses the unit of competency: Apply Electrical and electronics principles.

**Unit Duration:** 80 Hours

**Unit Description**

This unit describes the competences required in order to apply electrical and electronics principles. It involves applying basic concepts of electrical quantities, cells and batteries, magnetism and electromagnetism, basic electrical machines and electronics principles.

**Summary of Learning Outcomes**

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcomes** | **Duration (Hours)** |
|  | Apply basic concepts of electrical quantities | 10 |
|  | Apply DC and AC circuits | 10 |
|  | Apply the concept of cells and batteries | 10 |
|  | Apply magnetism and electromagnetism | 10 |
|  | Apply basic electrical machines | 20 |
|  | Apply electronics components | 20 |
| TOTAL | | 80 |

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

|  |  |  |
| --- | --- | --- |
| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| 1. Use the concept of basic Electrical quantities | * 1. Basic SI Units      1. Overview of SI Units         1. Power (Watts, W)         2. Current (Amperes, A)         3. Resistance (Ohms, Ω)         4. Voltage (Volts, V)   2. Conductors and Insulators      1. Identification and Characteristics         1. Metals vs. non-metals         2. Applications in electrical circuits   3. Electrical Quantities      1. Charge, Force, Work, and Power      2. Definitions and units      3. Calculations involving Electrical quantities   4. Ohm’s Law      1. Understanding Ohm's Law      2. Practical applications and calculations   5. Basic Electrical and Electronic Measurements      1. Measurement Techniques      2. Use of Multimeters, oscilloscopes, and ammeters      3. Measurement accuracy and calibration | * Portfolio of evidence * Practical test * Third party report * Written tests * Project work |
| 1. Apply DC and AC circuits | * 1. Introduction to Electrical Circuits      1. Introduction to electricity:      2. Voltage, current, and power.      3. Overview of DC and AC circuits.      4. Basic circuit elements: Resistors, capacitors, and inductors.   2. DC Circuit Analysis      1. Series and parallel circuits.      2. Voltage and current division principles.      3. Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL).      4. Analysis of complex circuits using KVL and KCL.      5. Hands-on lab: Building and testing DC circuits.   3. AC circuits analysis      1. Introduction to AC: Sinusoidal waveforms, frequency, and period.      2. RMS values, peak values, and average values.      3. AC voltage and current sources.      4. Phasor representation of AC quantities.      5. Impedance and admittance.      6. Series and parallel AC circuits.      7. Resonance in RLC circuits.      8. Practical analysis of AC circuits using phasors.      9. Power in AC Circuits         1. Power factor and power factor correction.         2. Real, reactive, and apparent power.         3. AC power calculations for single-phase and three-phase circuits.         4. Energy consumption and efficiency.         5. Applications of AC power in household and industrial settings.   4. Practical Activity:      1. Connection in series and Parallel Simulation | * Oral questioning * Portfolio of evidence * Practical test * Third party report * Written tests * Project work |
| 1. Apply the concept of cells and batteries | * 1. Introduction to Cells and Batteries   2. Overview of energy storage and electrochemical cells.   3. Basic concepts: Voltage, current, capacity, and energy density.   4. Internal resistance of cells and electromotive force, e.m.f.   5. Electrochemical principles: Redox reactions and electrode potentials.   6. Components of a cell: Anode, cathode, electrolyte, and separator.   7. Types of cells: Primary vs. secondary cells (non-rechargeable vs. rechargeable).   8. Primary Cells (Non-Rechargeable)      1. Zinc-Carbon Cells: Construction, chemistry, and applications.      2. Alkaline Cells: Advantages over zinc-carbon, usage, and performance characteristics.      3. Comparison of common primary cells (e.g., lithium primary cells).      4. Performance limitations and efficiency of primary cells.      5. Environmental impact and disposal considerations for non-rechargeable batteries.      6. Hands-on lab: Testing the performance of different primary cells.   9. Secondary Cells (Rechargeable)      1. Lead-Acid Batteries: Chemistry, construction, and applications (e.g., automotive).      2. Nickel-Cadmium (NiCd) and Nickel-Metal Hydride (NiMH): Differences, pros, and cons.      3. Charging and discharging cycles of rechargeable cells.      4. Lithium-Ion Batteries: Working principles, construction, and applications.      5. Advantages of lithium-ion technology over older battery types.      6. Safety considerations: Overcharging, thermal runaway, and battery management systems.      7. Emerging Technologies: Solid-state batteries, lithium-sulphur, and other advancements.      8. Energy density and power density considerations in modern applications.      9. Batteries maintenance      10. Hands-on lab: Disassembling and examining a rechargeable battery.   10. Battery Performance and Characteristics       1. Battery capacity: Ampere-hour (Ah) ratings and energy content.       2. Factors affecting battery life: Temperature, charge/discharge rates, and cycling.       3. Internal resistance and its effect on performance.       4. Battery efficiency and energy losses.       5. State of charge (SOC) and depth of discharge (DOD).       6. Battery degradation and aging mechanisms.       7. Measuring battery parameters (voltage, current, capacity).       8. Testing techniques for battery health and performance.       9. Hands-on lab: Performance testing of different battery types.   11. Applications of Batteries       1. Batteries in consumer electronics (e.g., smartphones, laptops).       2. Automotive applications: Starting, lighting, and ignition (SLI) batteries.       3. Electric vehicles (EVs) and hybrid electric vehicles (HEVs): Battery requirements and challenges.       4. Industrial and grid storage applications.       5. Renewable energy integration: Solar and wind energy storage solutions.       6. Specialized applications: Medical devices, aerospace, and military.       7. Case studies on battery failure and safety incidents.       8. Discussion on regulations and standards for battery use.   12. Environmental Impact and Recycling       1. Environmental impact of battery production and disposal.       2. Strategies for reducing the ecological footprint of battery technologies.       3. Recycling processes for different types of batteries.       4. Government policies and regulations regarding battery disposal.       5. Advances in battery recycling technologies.   13. Hands-on lab: Exploring the recycling process and evaluating eco-friendly battery alternatives. | * Portfolio of evidence * Practical test * Third party report * Written tests * Project work |
| 1. Apply magnetism and electromagnetism | * 1. Magnetic Circuits and Devices      1. Introduction to magnetic circuits.      2. Magnetic flux, magnetic field density, magnetic field strength, Reluctance, magnetomotive force (MMF), and magnetic flux.      3. Calculations involving magnetic circuits      4. Analogies between electric and magnetic circuits.      5. Magnetic materials in electrical devices (soft and hard magnetic materials).   2. Electromagnetic Induction      1. Faraday’s Law of electromagnetic induction.      2. Lenz's Law: Direction of induced EMF.      3. Practical applications: Electric generators and transformers.      4. Induced EMF in different configurations (moving conductors, changing magnetic fields).      5. Self-induction and mutual induction.      6. Transformers: Working principles, construction, and applications.      7. Step up and step-down transformers      8. Power losses in transformers.      9. Calculations involving transformers      10. Energy stored in magnetic fields. | * Oral questioning * Portfolio of evidence * Practical test * Third party report * Written tests * Project work |
| 1. Apply basic electrical machines | * 1. DC Machines      1. DC machine construction and types (motors and generators).      2. Working principle of DC generators and back EMF.      3. Types of DC generators: Series, shunt, and compound.      4. Working principle of DC motors.      5. Types of DC motors: Series, shunt, and compound.      6. Speed-torque characteristics of DC motors.      7. Performance analysis and efficiency of DC machines.      8. Starting methods for DC motors.      9. Hands-on lab: Testing and operating a DC motor/generator.   2. Induction Motors (AC Machines)      1. Introduction to induction motors: Construction and working principles.      2. Types of induction motors: Squirrel cage and wound rotor.      3. Rotating magnetic fields and slip in induction motors.      4. Equivalent circuit model of an induction motor.      5. Torque-speed characteristics.      6. Methods of starting and speed control.      7. Performance analysis of induction motors.      8. Losses and efficiency considerations.   3. Hands-on lab: Testing and operating an induction motor. | * Portfolio of evidence * Practical test * Third party report * Written tests * Project work |
| 1. Apply electronics components | * 1. Introduction to Electronic Components      1. Overview of electronics: What are electronic components?      2. Classification of components: Passive, active, and electromechanical.      3. Introduction to circuit symbols and schematic diagrams.      4. Basic electrical quantities and units (voltage, current, resistance).      5. Understanding datasheets and component specifications.      6. Overview of testing and measurement tools (multimeters, oscilloscopes).   2. Passive Components      1. Resistors: Types, color codes, power ratings, and applications.      2. Capacitors: Types (ceramic, electrolytic, film), capacitance value, and working voltage.      3. Charging and discharging of capacitors in DC circuits.      4. Applications of capacitors in filtering, timing, and energy storage.      5. Inductors: Types, inductance value, and applications.      6. Inductor behavior in DC and AC circuits.      7. Introduction to filters: RC, RL, and RLC circuits.   3. Semiconductor Devices      1. Diodes: Introduction to PN junctions, characteristics, and types (LEDs, Zener diodes, Schottky diodes).      2. Applications of diodes in rectification, voltage regulation, and signal clipping.      3. Transistors: Types (BJT and MOSFET), characteristics, and configurations.      4. Basic transistor circuits: Switches and amplifiers.      5. Hands-on lab: Building and testing simple diode and transistor circuits.      6. Special semiconductor devices: Thyristors, TRIACs, and optoelectronic devices.      7. Characteristics and applications in switching and control.   4. Integrated Circuits (ICs)      1. Overview of integrated circuits: Analog vs. digital ICs.      2. Operational amplifiers (Op-Amps): Characteristics and basic configurations.      3. Applications of Op-Amps in signal processing.      4. Timers and oscillators: 555 timer IC and its applications.      5. Voltage regulators: Linear and switching regulators.      6. Introduction to data converters (ADC and DAC).      7. Digital ICs: Logic gates and flip-flops.      8. Applications of digital ICs in basic logic circuits.      9. Hands-on lab: Building circuits using Op-Amps, timers, and logic gates.   5. Electromechanical and Specialized Components      1. Relays: Types, operation, and applications in switching.      2. Switches and connectors: Types and usage in electronic circuits.      3. Transformers: Basic operation, step-up/step-down functions, and isolation.      4. Displays: LED, LCD, and seven-segment displays.      5. Circuit Design and Practical Applications      6. Basic circuit design principles: Bread boarding, PCB layout, and soldering.      7. Introduction to circuit simulation tools (e.g., Multisim, LTSpice).      8. Testing and troubleshooting techniques.      9. Real-world applications of electronic components.      10. Building practical projects: Power supplies, audio amplifiers, and sensor-based circuits.      11. Hands-on lab: Final project assembly and testing. | * Portfolio of evidence * Practical test * Third party report * Written tests * Project work |

**Suggested Methods of Instruction**

* Demonstration by trainer
* Practice by the trainee
* Field trips
* Discussions

**Recommended Resources for 25 trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/Specifications** | **Quantity** | **Recommended Ratio (Item: Trainee)** |
| **A** | **Learning Materials** |  |  |  |
| 1 | Textbooks | Comprehensive texts on electrical and control principle. | 5 pcs | 1:5 |
| 2 | Charts | Visual aids covering electrical theories and safety protocols | 10 pcs | 1:2.5 |
| 3 | PowerPoint Presentations | For trainer’s use, covering course content and practical applications | 1 | 1:25 |
| **B** | **Learning Facilities & Infrastructure** |  |  |  |
| 1 | Lecture/Theory Room | Equipped with projectors and seating for 25 trainees, ~60 sqm | 1 | 1:25 |
| 2 | Workshop | Hands-on training area with workbenches, tools, and safety equipment, ~80 sqm | 1 | 1:25 |
| 3 | Computer Laboratory | Equipped with testing setups for electrical experiments, ~50 sqm.  Equipped with computers installed with Circuit simulation software. | 25 | 1:1 |
|  |  |  |  |  |
| **C** | **Consumable Materials** |  |  |  |
| 1 | Electrical Wires | Assorted sizes and color-coded (e.g., 1.5mm², 2.5mm², 4mm²) | 5 rolls | 1:5 |
| 2 | Insulation Tapes | For securing connections and insulation, assorted colors | 25 pcs | 1:1 |
| 3 | Breadboard | For prototyping and testing circuits | 5 pcs | 1:5 |
| 4 | Sensors | Assorted types (temperature, pressure, proximity) | 10 pcs | 1:2.5 |
| 5 | Signal generators | For generating AC signals | 5pcs | 1:5 |
| 6 | Transducers | Assorted | 10 pcs | 1:3 |
| 7 | Electronic components | Resistors, transistors, capacitors, relays, transformers. Integrated IC, OPAM. | 100pcs | 4:25 |
|  |  |  |  |  |
| **D** | **Tools and Equipment** |  |  |  |
| 1 | Screwdrivers | Assorted sets for various applications | 2 sets | 1:12.5 |
| 2 | Side Cutters | For cutting wires and cables | 4 pcs | 1:6.25 |
| 3 | Pliers | For gripping and bending wires | 3 pcs | 1:8.33 |
| 4 | Stripping Knives | For stripping insulation from wires | 4 pcs | 1:6.25 |
| 5 | Computers | Equipped with electrical and electronics simulation software | 5 pcs | 1:5 |
| 6 | Multimeters | For measuring voltage, current, and resistance | 5 pcs | 1:5 |
| 7 | Clamp Meters | For measuring current flow in circuits | 5 pcs | 1:5 |
| 8 | Oscilloscope | For observing waveforms and signals | 1 | 1:25 |
| 9 | Voltmeter | For measuring voltage | 1 | 1:25 |
| 10 | Ammeter | For measuring current | 1 | 1:25 |
| 11 | Signal Generator | For generating electrical signals for testing | 1 | 1:25 |
| 12 | Soldering gun | For soldering | 10 | 1:3 |
| 13 | Soldering wire | For making joints in electrical circuits | 10 | 1:3 |
| 14 | PLC | For program practice | 5 | 1:5 |
| 15 | Cells and batteries | For learning | 5 | 1:5 |
|  |  |  |  |  |
| **E** | **PPE (Personal Protective Equipment)** |  |  |  |
| 1 | PPE Sets | Includes helmets, gloves, safety goggles, shoes, and harnesses | 25 sets | 1:1 |
| 2 | Safety Signs and Barriers | For simulating safety zones and hazards | 10 sets | 1:2.5 |
| 3 | Earthing Test Kits | For ground testing and demonstrating earthing procedures | 5 pcs | 1:5 |
| 4 | Electrical Test Benches | For hands-on testing of functionality and circuit design | 5 pcs | 1:5 |
|  |  |  |  |  |
| **F** | **Reference Materials** |  |  |  |
| 1 | Industrial Automation Manuals | Covering principles and practices in automation | 25 pcs | 1:1 |
| 2 | Electrical Standards | Reference on industry standards (e.g., IEEE Guidelines) | 5 pcs | 1:5 |
| 3 | Technical Handbooks | On motors, drives, and wiring systems | 25 pcs | 1:1 |
| 4 | Training Presentations/Slides | Digital format for shared access among trainees | 1 | 1:25 |
| 5 | Multimedia Learning Modules | Digital licenses for videos and tutorials | 25 pcs | 1:1 |
| 6 | Practical Assessment Guides | Worksheets for practical assessments | 25 pcs | 1:1 |

**CORE UNITS OF LEARNING**

**GLASS COMPONENTS MAINTAINANCE**

**ISCED UNIT CODE:** 0716 451 19A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Maintain Glass Components

**Duration of unit:** 140 Hours

**Unit Description:**

This unit of learning covers the learning outcomes, content, assessment methods, methods of delivery and resources required to train rigging activities to maintain glass components. It involves competencies in inspect vehicle glass components, repair vehicle glass and performing housekeeping.

**Summary of Learning Outcomes**

By the end of this unit of learning, the trainee will be able to:

|  |  |  |
| --- | --- | --- |
| **S/No.** | **Learning Outcome** | **Duration (Hours)** |
|  | Inspect Vehicle Glass Components | 60 |
|  | Repair vehicle Glass | 60 |
|  | Perform House Keeping | 20 |
| **Total** | | 140 |

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

| **Learning Outcome** | **Content** | **Suggested Assessment Methods** |
| --- | --- | --- |
| 1. Inspect Vehicle Glass Components | * 1. Workplace preparation.  1. Debris removal. 2. Tools and materials arrangement    1. Tools and safety barriers set up. 3. Barriers and signage set up 4. Tools and safety equipment verification.    1. Glass inspection tools selection 5. Use tools such as magnifiers and lights for detailed inspection. 6. Prepare cleaning agents and polishing compounds for glass maintenance.    1. Glass edges inspection. 7. Chips 8. Cracks 9. Uneven edges.    1. Surface clarity assessment. 10. Glass examination     * + 1. Smudges         2. Scratches         3. Distortions affecting visibility     1. Glass mounting area inspection. 11. Verify the alignment of mounting surfaces 12. Check for debris and seal integrity | * Practical * Project * Written assessment * Oral assessment |
| 1. Repair vehicle glass | 1. Glass surface cleaning 2. Dust debris removal 3. Drying and preparation. 4. Repair resin/filler application. 5. Resin injection 6. Resin coverage and curing 7. Bubbles removal and surface polishing 8. Resin curing 9. UV light 10. curing agents     * 1. Filler application     1. Surface polishing | * Practical * Project * Written assessment * Oral assessment |
| 1. Perform House Keeping | * 1. Waste Disposal and Management.      1. Recycling and segregating materials   2. Disposing hazardous waste   3. Tools and Equipment      1. Cleaning tools   4. Storing tools and equipment   5. Cleaning the workshop | * Practical * Project * Written assessment * Oral assessment |

**Suggested Methods of Instruction**

* Practical
* Project Work
* Demonstrations
* Direct instruction with active learning strategies
* Group Discussions
* Demonstration

**Recommended Resources for 25 Trainees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/No.** | **Category/Item** | **Description/ Specifications** | **Quantity** | Recommended Ratio  (Item: Trainee) |
| **A** | **Learning materials and infrastructure** | | | |
|  | Training Classes: 1 session | 8M\*20M | 1 | 1:25 |
|  | Workshops: 1 practical workshop | 18M\*12M | 1 | 1:25 |
|  | Computer |  | 1 | 1:25 |
|  | Projector for presentations |  | 1 | 1:25 |
|  | Whiteboard for collaborative learning | 4 ft by 8 ft | 1 | 1:25 |
|  | Access to Internet |  | 1 | 1:25 |
|  | Textbooks | Textbooks on glass maintenance | 5 pcs | 1:5 |
|  |  |  |  |  |
| **B** | **Tools and Equipment** | | | |
|  | **Inspection Tools Set** | | | |
|  | Magnifiers | Various magnification levels | 5 | 1:5 |
|  | LED Inspection Lights | High-intensity | 5 | 1:5 |
|  | Crack Detection Tools |  | 5 | 1:5 |
|  | **Glass Repair Equipment** | | | |
| 1. | UV Curing Lamps | Professional grade | 5 | 1:5 |
| 2. | Resin Injection Tools | With pressure gauges | 5 | 1:5 |
| 3. | Polishing Equipment | Various grades | 5 | 1:5 |
|  | **Surface Preparation Tools** | | | |
|  | Glass Scrapers | Professional grade | 5 | 1:5 |
|  | Buffing Machines | Variable speed | 3 | 1:8 |
|  | **Measuring and Assessment Tools** | | | |
|  | Digital Thickness Gauges |  | 2 | 1:13 |
|  | Light Meters | For tint verification | 2 | 1:13 |
|  | Tool Storage Systems | Organized cabinets | 3 | 1:8 |
| **C** | **Materials** | | | |
|  | **Glass Repair Materials** | | | |
| 1. | Repair Resins | Various viscosities | 10 | 1:3 |
| 2. | UV Curing Agents | Professional grade | 10 | 1:3 |
| 3. | Glass Fillers | Various types | 10 | 1:3 |
| 4. | Cleaning Materials |  |  |  |
| 5. | Glass Cleaners | Professional grade | 5 | 1:5 |
| 6. | Microfiber Cloths | Lint-free | 25 | 1:1 |
| 7. | Surface Preparation Solutions |  | 5 | 1:5 |
|  | **Polishing Materials** | | | |
| 1. | Polishing Compounds | Various grades | 5 | 1:5 |
|  | Polishing Pads | Various types | 10 | 1:3 |
|  | Safety Equipment |  |  |  |
|  | Safety Glasses | UV protected | 25 | 1:1 |
|  | Work Gloves | Cut-resistant | 25 | 1:1 |
|  | Dust Masks |  | 25 | 1:1 |
|  | Safety Barriers | Portable | 5 | 1:5 |
|  | Warning Signs | Various types | 5 | 1:5 |
|  | **Practice Materials** | | | |
| 1. | Practice Glass Panels | With various defects | 10 | 1:3 |
| 2. | Training Glass Samples | Different types | 10 | 1:3 |
| 3. | Waste Management |  |  |  |
| 4. | Glass Disposal Containers | Cut-proof | 2 | 1:13 |
| 5. | Chemical Waste Containers | For resins and solutions | 2 | 1:13 |
| 6. | General Waste Bins |  | 3 | 1:8 |