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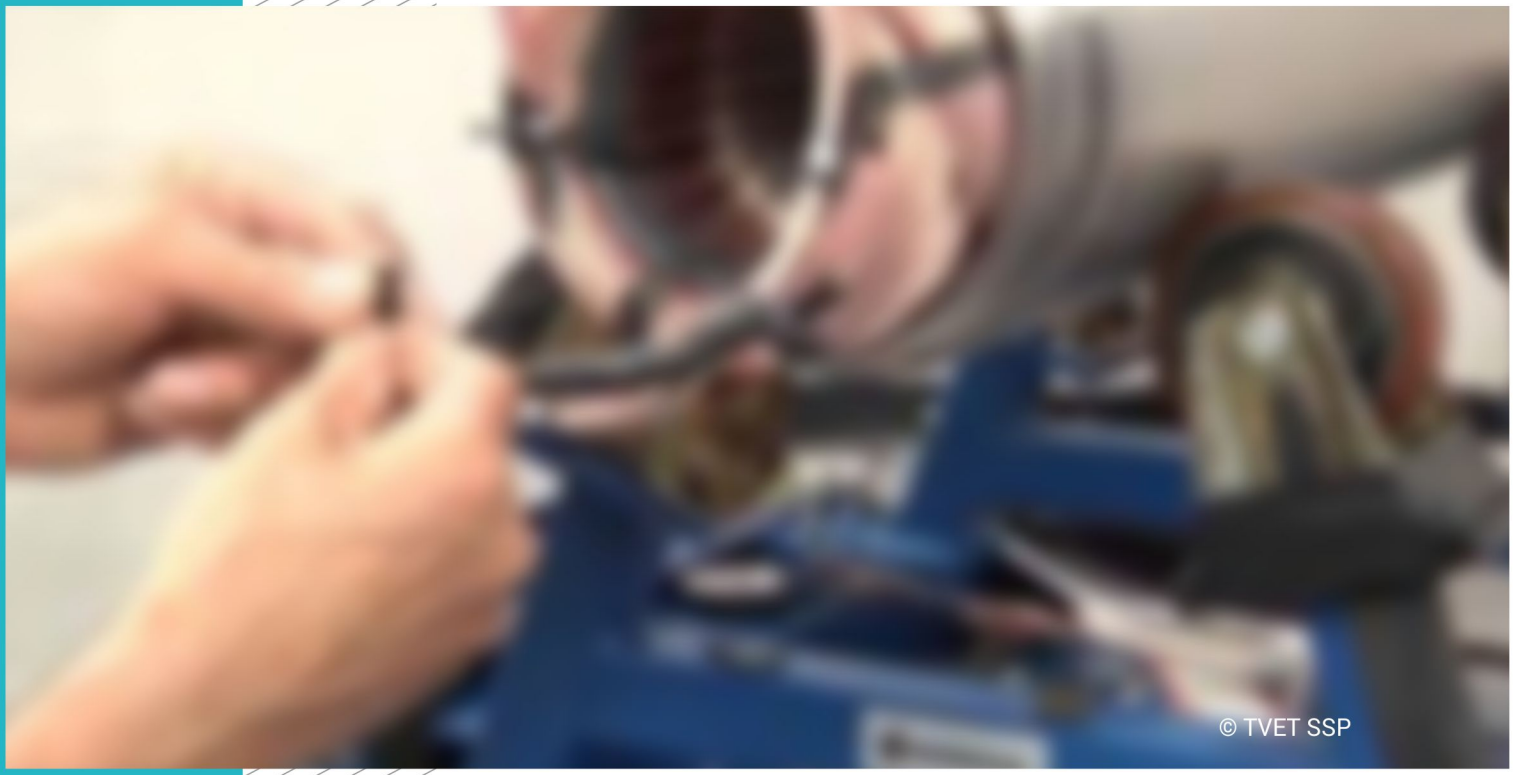
ELECTRICAL MACHINE WINDING TECHNICIAN



CBT Curriculum

National Vocational Certificate Level 4

Version 1 - September, 2018

NAVTTC

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Contents

Introduction

The Technical and Vocational Education and Training (TVET) sector in Pakistan is passing through a transition period of shifting from a traditional supply and time based training model to a Competency Based Training. In order to build capacity of the technical and vocational Training Institutes in Pakistan, through provision of demand driven Competency Based Trainings,the NAVTTC and TVET Sector Support Program (TSSP) have joined hands together to develop qualifications for Electrical Sector. These qualifications will not only build the capacity of existing workers of the sector but would also support the youth to acquire skills best fit for this sector. The benefits and impact of development of these qualifications will be both on demand and supply side.

Based upon demand of the industry, these competency-based qualifications for "**Electrical Machine Winding Technician**" are developed under the National Vocational Qualification Frame work (NVQF)(Level 1 to 4). The qualificationscover the competencies based on required knowledge, skills and professional attitude which are essential for getting a job or seeking self-employment.

These qualifications are also in line with the vision of Pakistan's National Skills Strategy (NSS), National TVET Policy and National Vocational Qualification Framework (NVQF). This provides policy directions, support and an enabling environment to the public and private sectors to impart training for skills development to enhance social and economic profile. The National Vocational & Technical Training Commission (NAVTTC) has approved the Qualification Development Committee (QDC).The QDC consist of experts from the relevant industry belonging to different geographical locations across the country and academicians who were consulted during the development process to ensure their input and ownership of all the stakeholders. The National Competency Standards have been used as a reference document for the development of this curricula to be followed by the training institutions across the country.

1.1 Competencies to be gained after completion of the course

The detail of competency standards included in these qualifications is given below:

National Vocational Certificate level 1, in (Electrical Sector) "Electrical Machine Winding Technician"

- Comply with Work Health and Safety Policies
- Obey the Workplace Policies and Procedures
- Follow Basic Communication Skills (General)
- Operate Computer Functions(General)
- Perform Safe Transportation of Faulty Machine

National Vocational Certificate level 2, in (Electrical Sector) "Electrical Machine Winding Technician"

- Comply Personal Health and Safety Guidelines
- Communicate the Workplace Policy and Procedure
- Perform Basic Communication (Specific)
- Perform Basic Computer Application (Specific)
- Maintain Tools/ Equipment and Machinery
- Perform on-site Inspection/testing of machine
- Carry out Mechanical De- Installation of Machine
- Ensure Electrical isolation of Machine

National Vocational Certificate level 3, in (Electrical Sector) "Electrical Machine Winding Technician"

- Apply Work Health and Safety Practices (WHS)
- Identify and Implement Workplace Policy and Procedures
- Communicate at Workplace
- Perform Computer Application Skills
- Manage Personal Finances
- Disassemble Machine at Workshop
- Estimate repair /replacement cost
- Diagnose fault of machine (motor)
- Perform Motor Rewinding
- Perform Transformer Rewinding
- Carry out Re- Assembly of Machine

National Vocational Certificate level 4, in (Electrical Sector) "Electrical Machine Winding Technician"

- Contribute to Work Related Health and Safety (WHS) Initiatives
- Analyse Workplace Policy and Procedures
- Perform Advanced Communication
- Develop Advance Computer Application Skills
- Manage Humane resources
- Develop Entrepreneurial Skills
- Repair / replace allied parts of machine (Motor)
- Repair / replace allied parts of machine (Transformer)

1.2 Purpose of training

The aim of the training is to produce employable skilled manpower to improve the existing capacity of Electrical sector. This training will provide the requisite skills, knowledge and competence to the trainees to carry out **winding of Electrical Machines (Motor &Transformer) and Repair/replace allied parts of electrical machines** as well. It will also enable the existing skilled workers who gained their competencies in the said field through informal and non formal means of training and who are desirous to recognize their competence level through the assessment tool of Recognition of Prior Learning (RPL).This training will enable them to meet the challenges in the field as "**Electrical Machine Winding Technician**" in the industry and will prepare such a competitive skilled workforce who will be globally acceptable and the unemployed youth who get the training will find employment or become successful entrepreneurs

1.3 Overall objectives of training program

The Electrical Machine Winding Technician Qualifications level 1-4 consists of the theoretical and practical details along with the professional attitude of technicians required to perform the tasks assigned as a**Electrical Machine Winding Technician** in electrical industries/Workshop. The main objectives of the qualification are as follows:

- .Performing on-site Testing/ Inspection of E/ Machine
- Carrying out Electrical isolation of Machine
- Carrying out Mechanical de coupling of Machine
- Performing safe transportation of faulty Machine
- Disassembling of faulty Machine
- Detecting faults in E/ Machine
- Performing Cost estimation for the repair/ replacement work
- Repairing /replacement of allied parts of Electric Machine (Motor/Transformer)
- Maintaining Tools/ equipment and Machinery
- Carrying out Rewinding of Motor/ Transformer
- Re-assembling of Electric machine
- Development of entrepreneurial skills

1.4 Date of Validation

The level 1-4 of National vocational qualification on **Electrical Machine Winding Technician** has been validated by the Qualifications Development Committee (QDC) members on 12/11/2019 and will remain in currency until Oct.22

1.5 Codes of Qualifications

The International Standard Classification of Education (ISCED) is a framework for assembling, compiling and analyzing cross-nationally comparable statistics on education and training. ISCEDcodesfor these qualifications areassigned as follows:

ISCED Classification for Electrical Machine Winding Technician **level 1-4**	
Code	**Description**
0713 E&E 024	National Vocational Certificate level 1, in (Electrical Sector) “Electrical Machine Winding Technician”
0713 E&E 025	National Vocational Certificate level 2, in (Electrical Sector) “Electrical Machine Winding Technician”
0713 E&E 026	National Vocational Certificate level 3, in(Electrical Sector) “Electrical Machine Winding Technician”
0713 E&E 027	National Vocational Certificate level 4, in (Electrical Sector) “Electrical Machine Winding Technician”

1.6 Members of Qualifications Development Committee

The following members participated in the qualifications development and of these qualifications:

S#	Name	Designation	Contact No	Email	Organization	Role in Q. D. C
1.	Mr. Arif Hussain Shah	Sr. Manager Electrical			Pak China Chemicals, Faisalabad	Work shop Participants
2.	Mr. Jaffar Ali	Motor Winder / Owner			Mian Electric, Lahore	Work shop Participants
3.	Mr. Aqeel Ahmad	Motor Winder / Owner			Hafiz Electric Repairing Works, Lahore	Work shop Participants
4.	Engr. Safdar Ali	Deputy Manager Technical			Millat Equipment Ltd., Lahore	Work shop Participants
5.	Mr. Muhammad Naheed	Electrical Motor Winder			Creative Electronics – Sky Power, Lahore	Work shop Participants
6.	Mr. Zafar Iqbal	Director			Zafar Electric and Mechanical Workshop, Gujranwala.	Work shop Participants
7.	Mr. Afzal Bashir	Senior Instructor			P-TEVTA, GCT, Sialkot	Work shop Participants
8.	Mr. Hakim Ali Ujjan	Assistant Professor			S-TEVTA, GCT, Hyderabad	Work shop Participants
9.	Mr. M. Mahboob Butt	Chief Instructor	0335-4004652	mmahboobbutt@gmail.com	P-TEVTA, GCT, Sahiwal	Work shop Participants
10.	Mr. Umar Zaman Khan	Assistant Professor			KP-TEVTA, GCT, Swat	Work shop Participants
11.	Mr. Maqsood Ahmad	Chief Instructor			PVTC / VTI, Lahore	Work shop Participants
12.	Mr. Abdul Razzaq	Senior Instructor			P-TEVTA, GCT, Gujranwala	Work shop Participants
13.	Mr. Ahmed Bux Lilla	Manager			Transfopower, Lahore	Work shop Participants
14.	Mr. Ibrahim Sarfraz	Application Engineer			KSB Pumps, Lahore	Work shop Participants
15.	Engr. Abdul Maqsood	Principal / DACUM Facilitator	0300-9030560	Wadood22@yahoo.com	KP-TEVTA, Mardan	DACUM Facilitator
16.	Mr. Ayoub Elahi	Data Center Officer	0323-9877097	ayoubelahi@hotmail.com	UOL, Lahore	Co Facilitator

S#	Name	Designation	Contact No	Email	Organization	Role in Q. D. C
17.	Mr. Saad Saeed	Provincial Coordinator			GFA, Lahore	Provincial Coordinator

1.7 Entry level of trainees

The entry requirement for National Vocational Certificate level 1-4, in (Electrical Sector) “Electrical Machine Winding Technician “are given below**:**

Title	Entry requirements
National Vocational Certificate level 1, in (Electrical Sector) “Electrical Machine winding Technician”	Entry for assessment for this qualification is open. However, entry into formal training institutes, based on this qualification may require skills and knowledge equivalent to middle (school /Grade 8 certificate).
National Vocational Certificate level 2, in (Electrical Sector) “Electrical Machine Winding Technician”	Entry for assessment for this qualification is open. However entry into formal training institute for this qualification is a person having National Vocational Certificate level 1, in (Electrical Sector) “Electrical Machine Winding Technician”
National Vocational Certificate level 3, in (Electrical Sector) “Electrical Machine Winding Technician”	Entry for assessment for this qualification is open. However entry into formal training institute for this qualification is a person having National Vocational Certificate level 2, in (Electrical Sector) “Electrical Machine Winding Technician”
National Vocational Certificate level 4, in (Electrical Sector)	Entry for assessment for this qualification is open. However entry into formal training institute for this qualification is a person having National Vocational Certificate level 3, in

Title	Entry requirements
"Electrical Machine Winding Technician"	(Electrical Sector) "Electrical Machines Winding Technician"

a. Minimum qualification for teachers/instructor

- Should have completed intermediate or equivalent qualifications
- Must be a holder of G -I Certificate or Three years DAE in Electrical Technology.
- Must be able to communicate effectively
- Must have at least 4 years teaching experience.

b. Medium of Instruction

Urdu, local language

c. Duration of the course

The proposed curriculum is composed of **32 Modules** that will be covered in 1800 **Learning hours**.

The distribution of contact hours is given below:

Total contact Hrs = 1800 Or Credit hours =180

Theory: 360 hours (20%)

Practical: 1440 hours (80%) institute com industry attachment

2. Categorization and Levelling of the Competency Standards

0713001135		25	Repair / replace allied parts of machine (Motor)	Technical	4	120	12
0713001136		26	Repair / replace allied parts of machine (Transformer)	Technical	4	90	9
102200848	Level-4	27	Contribute to Work Related Health and Safety (WHS) Initiatives	Generic	4	30	3
041700841		28	Analyse Workplace Policy and Procedures	Generic	4	30	3
001100853		29	Perform Advanced Communication	Generic	4	30	3
061100858		30	Develop Advance Computer Application Skills	Generic	4	40	4
041300869		31	Manage Human Resource	Generic	4	20	2
041300860		32	Develop Entrepreneurial Skills	Generic	4	30	3
					Total Learning & Credit Hours of Level - 4	390	39

3. Overview of the curriculum for " Electrical Machine Winding Technician" (Level 1-4)

Module Title and Aim	Learning Units	TheoryDays /hours	WorkplaceDays/hours	Timeframe of modules
Module A. Repair / replace allied parts of machine (Motor)	**LU1.** Prepare for work to repair / replace allied parts of machine (Motor) **LU2.** Replace Bearing **LU3.** Replace Bush **LU4.** Replace Carbon Brushes **LU5.** Repair/Replace Commutator / sliprings **LU6.** Check Rotor Shaft **LU7.** Repair/Replace Centrifugal Switch (Clutch)of Motor **LU8.** Replace Capacitor of Motor **LU9.** Repair/Replace Terminal of Motor	**24**	**96**	**120**
Module B. Repair / replace allied parts of machine (Transformer)	**LU1.** Prepare for work to repair / replace allied parts of machine (Transformer) **LU2.** Collect the required materials/parts **LU3.** Perform filtration of Transformer Oil **LU4.** Replace Transformer Oil **LU5.** Perform De- Hydration of Silica Gel **LU6.** Repair / Replace Transformer Bushing **LU7.** Repair/ Replace Tap Changer **LU8.** Check main Tank body of Transformer for leakage **LU9.** Repair/Replace Buchholz Relay	**18**	**72**	**90**

Module C: Contribute to Work Related Health and Safety (WHS) Initiatives	**LU1. Contribute to initiate work-related health and safety measures** **LU2. Contribute to establish work-related health and safety measures** **LU3. Contribute to ensure legal requirements of WHS measures** **LU4. Contribute to review WHS measures** **LU5. Evaluate the organization's WHS system**	**6**	**24**	**30**
Module D: Analyse Workplace Policy and Procedures	**LU1. Manage work timeframes** **LU2. Manage to convene meeting** **LU3. Decision making at workplace** **LU4. Set and meet own work priorities at instent** **LU5. Develop and maintain professional competence** **LU6. Follow and implement work safety requirements**	**6**	**24**	**30**
Module E: Perform Advanced Communication	**LU1. Demonstrate professional skills** **LU2. Plan and Organize work** **LU3. Provide trainings at workplace**	**6**	**24**	**30**
Module F: Develop Advance Computer Application Skills	**LU1. Manage Information System to complete a task** **LU2. Prepare Presentation using computers** **LU3. Use Microsoft Access to manage database** **LU4. Develop graphics for Design**	**8**	**32**	**40**
Module G: Manage Human Resource	**LU1. Determine strategies for delivery of human resource services** **LU2. Manage the delivery of human resource services** **LU3. Evaluate human resource service delivery** **LU4.** Manage integration of business ethics in human resource	**4**	**16**	**20**

	practices			
Module H: Develop Entrepreneurial Skills	**LU1.** **Develop a business plan** **LU2.** **Collect information regarding funding sources** **LU3.** **Develop a marketing plan** **LU4.** **Develop basic business communication skills**	**6**	**24**	**30**

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-A
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4. Detail of Modules

Part-I Core/Technical Modules

Module A: 0713001135 Repair / Replace allied parts of Machine (Motor)

Objective: This Modulecovers the knowledge & skills required to Repair / replace allied parts of machine (Motor) through Prepare for work, Replace Bearing , Replace Bush , Replace Carbon Brushes , Repair/Replace Commutator Check Rotor Shaft , Repair/Replace Centrifugal Switch of Motor, Replace Capacitor of Motor , Repair/Replace Terminal plate of Motor ,

Duration: 120 Hours **Theory: 24 Hours** **Practice: 96 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1.Prepare for work to repair / replace allied parts of machine (Motor)	**The trainee is able to:** • Identify the required PPE's • Collect the required PPE's • Identify the required tools and equipment • Collect the required tools and equipment • Ensure functional condition of PPE's/Tools and equipment	• Prepare list&Recognition of required Tools, Equipment and PPEs for mechanical De-Installation of Machine • Importance of functional conditions of required Tools, Equipment and PPEs and their use • Importance of safe working condition regarding • Clear passage • Cleanliness • Adequate light • Ventilation	**Th. 2 Hrs.** **Pr. 3 Hrs.**	**Tools** • Spanner Set Screw Driver Set • Allen key Set • Clamp Meter **Consumables Items** • Hand Gloves • Safety Shoes • Safety Goggles	Class room / workshop / labs

	• Ensure safe working conditions ➢ Clear Passage ➢ Cleanliness ➢ Adequate light ➢ Ventilation				
LU2. Replace Bearing	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Remove the faulty bearing • Collect the relevant number bearing from store • Replace the bearing • Update record	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Describe procedure for selection of right size of bearing. • Describe techniques of replacing faulty bearing. • State method of updating the record.	**Th.** **2 Hrs.** **Pr.** **12 Hrs.**	**Tools** • Screw driver set • Spanner set • Combination plier • Elenkey set • Outside calliper • Inside calliper • Vernier calliper • Bearing puller • Magnifier glass **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Bearing	Class room / workshop / lab
LU3. Replace Bush	**The trainee is able to:** • Wear the required PPE's • Pick the required	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Describe procedure for	**Th.** **2 Hrs.** **Pr.** **14 Hrs.**	**Tools** • Screw driver set • Spanner set	Class room / workshop / lab

	tools and equipment • Remove the faulty bush • Collect the relevant size of bush from store • Replace the bush • Update record	selection of right size of bush. • Describe techniques of replacing faulty bush. • State method of updating the record.		• Combination plier • Allen key set • Outside calliper • Inside calliper • Vernier calliper • Hammer • Bush Remover Steel Rod **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Bush	
LU4. Replace Carbon Brushes	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Remove the faulty carbon brush • Collect the relevant size and material of carbon brush from store • Replace the carbon brush	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Describe method of inspection of carbon brush • Describe procedure for selection of right size of carbon brush. • Describe techniques of replacing faulty carbon brush. • State method of updating the record.	**Th.** **3 Hrs.** **Pr.** **11 Hrs.**	**Tools** • Screw driver set • Spanner set • Combination plier • Allen key set • Long nose plier • Curved nose plier • Magnifier glass • Tweezers **Consumable Material** • Lead Pencil	Class room / workshop / lab

	• Update record			• Eraser • Paper / • Inventory register • Sand paper zero size • Carbon Brush	
LU5. Repair/Replace Commutator/Slipring s	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Check smoothness of the surface of the commutator/slip rings • Perform required surfacing of commutator/slip rings • Perform undercutting of mica between segments of commutator with hacksaw blade • Perform cleaning of commutator/slip	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Describe procedure for checking / inspection of commutator / slipring • Describe techniques / procedure for repairing of commutator/sliprings: ➢ Cleaning ➢ Surfacing ➢ Under cutting Mica • Describe techniques / procedure for replacement of commutator / sliprings • State method of updating the record.	**Th.** **3 Hrs.** **Pr.** **14 Hrs.**	**Tools** • Screw driver set • Spanner set • Combination plier • Allen key set • Outside calliper • Inside calliper • Vernier calliper • Hacksaw • Soldering Iron • Soldering Gun • Heat Gun **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Solder wire • Soldering flux • Sand Paper	Class room / worksho p / lab

	rings • Remove short circuited commutator/slip rings from the motor shaft • Collect the relevant size of commutator/slip ring from store • Replace the commutator/slip rings • Update record			• Shrinkable sleeves • Commutator • Slipring	
LU6. Check Rotor & its Shaft	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Check smoothness of the surface of the rotor shaft • Check size of shaft according to inner diameter of bearing • Perform welding of shaft for sizing if required	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Describe procedure for checking of rotor bars / rings ➢ Short Circuit ➢ Open Circuit ➢ Damaged bars • Describe procedure for checking / inspection of rotor shaft: ➢ Smoothness of surface ➢ Size of shaft according to inner diameter of bearing • Describe techniques /	**Th.** **3 Hrs.** **Pr.** **15 Hrs.**	**Tools** • Screw driver set • Spanner set • Combination plier • Allen key set • Outside calliper • Inside calliper • Vernier calliper • Bearing puller • Magnifier glass • Lathe Machine • Welding Plant • Growler **Consumable Material**	Class room / workshop / lab

	• Perform surfacing of rotor shaft to acquire correct bearing size • Check balance of rotor shaft • Perform balancing of rotor shaft if required • Perform cleaning of rotor shaft • Update record	procedure for welding and surfacing of shaftto acquire correct size of bearing • Describe techniques / procedure for balancing of rotor shaft • State method of updating the record.		• Lead Pencil • Eraser • Paper / • Inventory register • Welding Rod • Sand Paper • Cotton waste • Kerosene oil • Cleaning brush • Grease	
LU7. Repair/Replace Centrifugal Switch (Clutch) of Motor	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Check working of centrifugal switch • Set working of centrifugal switch • Check contact points of centrifugal switch • Perform surfacing of contact points of centrifugal switch • Perform cleaning of contact points	• Demonstration regarding selection & use of required Tools, equipment &PPEs • State centrifugal switch & describe procedure for checking / inspection of centrifugal switch • Describe techniques / procedure for surfacing of contacts of centrifugal switch • Describe techniques / procedure for replacement of centrifugal switch • State method of updating the record.	**Th.** **4 Hrs.** **Pr.** **11 Hrs.**	**Tools** • Screw driver set • Spanner set • Combination plier • Allen key set • Outside calliper • Inside calliper • Vernier calliper • File **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Sand Paper	Class room / worksho p / lab

	of centrifugal switch • Update record			• Centrifugal switch • Sand paper	
LU8. Replace Capacitor of Motor	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Check the capacitor • Select the required capacitor size. • Collect the capacitor from main store. • Replace the faulty capacitor • Update record	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Define capacitor & describe techniques / procedure for checking of capacitor • Describe techniques / procedure for replacement of capacitor • State method of updating the record	**Th.** **2 Hrs.** **Pr.** **8 Hrs.**	**Tools** • Screw driver set • Spanner set • Combination plier • Allen key set • Magnifier glass • Series board • LCR meter **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Capacitor	Class room / worksho p / lab
LU9. Repair/Replace terminals of Motor	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of the terminal plate and terminals of motor	• Demonstration regarding selection & use of required Tools, equipment &PPEs • Describe techniques / procedure for checking of terminal plate and terminals of motor • Describe techniques / procedure for repair of terminal plate / terminals of motor:	**Th.** **3 Hrs.** **Pr.** **8 Hrs.**	**Tools** • Screw driver set • Spanner set • Combination plier • Allen key set • Thimble press • Half Round File **Consumable Material**	Class room / worksho p / lab

	• Perform cleaning of terminals and terminal plate to remove carbon dust • Check fixing of terminal plate • Check the terminal linking strips • Repair**/**Replace the faulty part • Update record	➢ Cleaning ➢ Surfacing ➢ Linking strips • Describe techniques / procedure for replacement of terminal plate / terminals of motor • State method of updating the record		• Lead Pencil • Eraser • Paper / • Inventory register • Terminal Plate • Terminal nut & bolts • Linking strip • Sand paper • Thimbles	

Critical Evidence(s)

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:

- ➢ Replace the faulty bearing
- ➢ Replace the faulty bush
- ➢ Replace the faulty carbon brush
- ➢ Replace short circuited commutator/sliprings from the motor shaft
- ➢ Replace the faulty capacitor
- ➢ Perform cleaning of terminals and terminal plate to remove carbon dust
- ➢ Replace faulty terminal plate

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Module-B
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Module B: 0713001136 Repair / replace allied parts of machine (Transformer)

Objective: This Modulecovers the knowledge & skills required to Repair / replace allied parts of machine (Transformer through Prepare for work , Collect the required materials/parts , Perform filtration of Transformer Oil , Replace Transformer Oil , Perform De- Hydration of Silica Gel , Repair / Replace Transformer Bushing , Repair/ Replace Tap Changer , Check main Tank body of Transformer for leakage , Check Buchholz Relay ,

Duration: 90 Hours **Theory: 18 Hours** **Practice: 72 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare	**The trainee is able to:**	• Prepare	**Th.**	**Tools**	Class room

for work to repair / replace allied parts of machine (Transformer)	• Identify the required PPE's • Collect the required PPE's • Identify the required tools and equipment • Collect the required tools and equipment • Ensure functional condition of PPE's/Tools and equipment • Ensure safe working conditions ➢ Clear Passage ➢ Cleanliness ➢ Adequate light ➢ Ventilation	list&Recognition of required Tools, Equipment and PPEs for mechanical De-Installation of Machine • Importance of functional conditions of required Tools, Equipment and PPEs and their use • Importance of safe working condition regarding • Clear passage • Cleanliness • Adequate light • Ventilation	**2 Hrs.** **Pr.** **3 Hrs.**	• Spanner Set Screw Driver Set • Allen key Set • Clamp Meter • Safety Belt **Consumables Items** • Hand Gloves • Safety Shoes • Safety Goggles	/ workshop / labs
LU2. Collect the required materials/parts	**The trainee is able to:** • Collect list of the estimated material/parts for repair • Check availability of the required parts/material in the store • Place purchase order for the deficient parts/materials • Collect the required parts/materials from the	• Demonstration regarding selection & use of required Tools, equipment &PPEs • State procedure for: ➢ Checking availability of required parts in store according to material list ➢ Collection of	**Th.** **2Hrs.** **Pr.** **7 Hrs.**	**Tools** **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Required material parts as per list	Class room / workshop / lab

	store	required parts from store ➢ Purchase of required parts from market			
LU3. Perform filtration & de-hydration of Transformer oil	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Collect oil sample • Check the dielectric strength of the oil • Drain out oil from transformer tank • Perform filtration of transformer oil • Perform De-Hydration of transformer oil • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • State properties of transformer oil • Describe procedure for: ➢ Collection of sample of transformer oil ➢ Testing dielectric strength of transformer oil ➢ Draining out of transformer oil from tank • Explain on load / live and off load methods used for filtration / de-hydration of transformer oil	**Th. 2Hrs.** **Pr. 10 Hrs.**	**Tools** • Spanner set • Adjustable Screw wrench • Storage Drum • Filtration & De-Hydration plant • Transformer oil testing equipment **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register	Class room

		• State method of updating the record			
LU4. Replace Transformer Oil (if needed)	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Drain out old transformer oil from tank • Arrange new transformer oil • Refill new transformer oil in tank • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure for: ➢ Draining out of transformer oil from tank ➢ Arranging of new transformer oil ➢ Refilling new transformer oil in tank • State method of updating the record	**Th.** **2 Hrs.** **Pr.** **8 Hrs.**	**Tools** • Spanner set • Adjustable Screw wrench • Storage Drum • Hand operated oil pump **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • New Transformer oil	Class room / workshop / lab
LU5. Perform De- Hydration of Silica Gel	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Open breather of transformer • Remove silica gel from	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure for: ➢ Opening the	**Th.** **3 Hrs.** **Pr.** **7 Hrs.**	**Tools** • Spanner set • Adjustable Screw wrench • De-Hydration	Class room / workshop / lab

	breather of transformer • Perform de-hydration of silica gel by: ➢ Spreading silica gel under sun light ➢ Heating up silica gel in oven up to 120Cº • Update record	breather of transformer ➢ Removing silica gel from breather of transformer ➢ Explain different methods used for de-hydration of silica gel • State method of updating the record		oven **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Silica gel • Plastic Sheet	
LU6. Repair / Replace Transformer Bushings	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of transformer bushings • Perform cleaning of transformer bushing to remove carbon dust • Check the fixing of transformer bushing • Replace the damaged transformer bushing • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure for: ➢ Physical checking of transformer bushings ➢ Cleaning of transformer bushings ➢ State possible faults of transformer bushings	**Th.** **2 Hrs.** **Pr.** **10 Hrs.**	**Tools** • Spanner set • Adjustable Screw wrench • Combination plier • Hammer **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Transformer	Class room / workshop / lab

		➢ Checking the fixing of transformer bushings ➢ Replacement of damaged transformer bushings • State method of updating the record		bushings • Kerosene oil • Petrol • Cotton waste • Transformer bushing gas kit • Samad bond	
LU7. Repair/ Replace Tap Changer	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of the tap changer • Perform cleaning of contact terminals of tap changer to remove carbon dust • Check the fixing of tap changer • Check the connections of linking cables • Replace the faulty tap changer • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure for: ➢ Physical checking of transformer tap changer ➢ Cleaning contacts of transformer tap changer ➢ State possible faults of transformer tap changer ➢ Checking the fixing of	**Th.** **2 Hrs.** **Pr.** **10 Hrs.**	**Tools** • Spanner set • Adjustable Screw wrench • Combination plier • Hammer • Flat File **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Transformer Tap Changer • Sand Paper	Class room/Lab/ Workshop

		transformer tap changer ➢ Replacement of faulty transformer tap changer • State method of updating the record		• Cotton waste • Cotton Tape • Paper Tape • Varnish	
LU8. Check main Tank body of Transformer for leakage	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Perform physical Checking of the tank • Locate leakage point in main tank of transformer • Drain out oil from main tank • Refer for welding of the leakage point • Re-fill oil in main tank • Perform physical Checking of the tank • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe procedure for: ➢ Physical checking of transformer tank ➢ Locating of leakage point in transformer tank ➢ Draining out oil from transformer tank ➢ Welding of transformer tank ➢ Refilling of	**Th.** **1 Hrs.** **Pr.** **7 Hrs.**	**Tools** • Spanner set • Adjustable Screw wrench • Combination plier • Hammer • Oil Drum • Welding Plant **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Transformer • Kerosene oil • Cotton waste	Class room / workshop / lab

		transformer oil in tank ➢ Final checking of leakage point • State method of updating the record		• Red Oxide Paint • Enamel Spray Paint	
LU9. Repair/Replace Buchholz Relay	**The trainee is able to:** • Wear the required PPE's • Pick the required tools and equipment • Check Buchholz relay • Remove Buchholz Relay from transformer • Repair/Replace Buchholz relay • Update record	• Demonstration regarding selection & use of required Tools, equipment & PPEs • Describe Working principle and possible faults of Buchholz relay • Describe procedure for: ➢ Checking of Buchholz relay ➢ Replacement of Buchholz relay • State method of updating the record	**Th.** **2 Hrs.** **Pr.** **10 Hrs.**	**Tools** • Spanner set • Adjustable Screw wrench • Combination plier • Hammer **Consumable Material** • Lead Pencil • Eraser • Paper / • Inventory register • Transformer Buchholz relay • Cotton waste	Class room / workshop / lab

Critical Evidence(s)

The candidate needs to produce any or all of the following documents/evidences:

1. **Portfolio**
2. **Assignment(s)/Project(s)**
3. **Relevant Certification(s)**
4. **Relevant Job/Experience Letter**

Furthermore, the candidate must execute **demonstration(s)**, which may include but are not limited to, the following:

- Take sample of transformer oil
- Check dielectric strength / flash over voltage test of the oil
- Perform filtration of transformer oil
- Perform de-hydration of transformer oil
- Perform de-hydration of silica gel
- Replace the damaged transformer bushing
- Perform cleaning of contact terminals of tap changer to remove carbon dust
- Replace the faulty tap changer
- Check Buchholz relay
- Repair/Replace Buchholz Relay from transformer

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-C
CBT Curriculum

National Vocational Certificate Level 4

Version 1 - September, 2018

Part-II Generic Competencies / Modules

Module C: Contribute to Work Related Health and Safety (WHS) Initiatives

Objective: This unit describes the skills and knowledge required to manage the identification, review, development, implementation and evaluation of effective participation and consultation processes as an integral part of managing work health and safety (WHS).

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Contribute to initiate work-related health and safety measures	**The trainee is able to:** • compile database on work-related health and safety • Identify measures that address legal obligations. • Consult with individuals/ parties to formulate measures and initiatives • Consult with				

	individuals/parties to identify factors impacting on work-related health and safety • Participate in consultative meetings.				
LU2. Contribute to establish work-related health and safety measures	**The trainee is able to:** • Assist in planning of work-related health and safety measures • Contribute to the development of work-related health and safety measures • Identify to implement work-related health and safety measures i.e. a. resourcing requirements, b. timelines c. responsibilities • Assist to implement				

	work-related health and safety measures and initiatives i.e. a. scheduling b. liaison c. administering resources d. communication				
LU3. Contribute to ensure legal requirements of WHS measures	**The trainee is able to:** • Identify WHS legar requirements • Apply knowledge of all aspects of WHS measures to a. Consultation b. workplace policies c. participation processes • Ensure, WHS measures are in accordance with legal requirements				
LU4. Contribute to	**The trainee is able to:** • Develop effective				

review WHS measures	practices to review work-related health and safety measures • Assist individuals and parties related to WHS measures in following activities a. preparing reports b. communicating review c. evaluating outcomes				
LU5. Evaluate the organization's WHS system	**The trainee is able to:** • Assess ongoing compliance with OHS (Occupational Health and safety) • Take feedback from concerned persons regarding WHS measures. • Assess the overall effectiveness of WHS management practices • Assist the development process				

	of WHS measures in following ways • Suggest amendments a. Document amendments b. Implement amendments • Take feedback from concerned persons regarding WHS measures. • Communicate improvements in WHS Measures				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Explain the application of relevant mandatory health monitoring, including biological monitoring, to help secure work health and safety

K2: Explain the difference between work-related health and safety measures and initiatives designed to meet specific legislative requirements and obligations, and those designed to support non-statutory health promotion programs, and give examples of each

K3: List factors that impact on work-related health and safety and their potential effects

K4: Identify internal and external sources of WHS information and data, and how to access them

K5: Outline organizational WHS and other relevant policies, procedures, processes and systems, including human resources

K6: Summarize relevant WHS legislation, other legislation (such as privacy and workers compensation) and common law rights and duties specific to work-related health and safety measures and initiatives

K7: Describe work-related health and safety measures and initiatives that either address specific legislative requirements and obligations, or support non-statutory health prevention programs, including:

- The factors impacting on worker health and safety that they address
- Effectiveness
- Costs and benefits
- Criteria for decisions regarding their implementation in a specific workplace
- How they should be implemented

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to contribute work-related health and safety measures and initiatives. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-D
CBT Curriculum
National Vocational Certificate Level 4

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Module D: Analyse Workplace Policy and Procedures

Objective: This unit describes the skills and knowledge required to implement a workplace policy & procedures and to modify the policy to suit changed circumstances. It applies to individuals with managerial responsibilities who undertake work developing approaches to create, monitor and improve strategies and policies within workplaces and engage with a range of relevant stakeholders and specialists.

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Manage work timeframes	**The trainee is able to:** Complete work tasks within deadlines in according to order of priority • Supervisors are informed of any delays in work times or projects				
LU2. Manage to convene meeting	**The trainee is able to:** • Develop agenda in line with meeting purpose				

	• Select participants and notify them accordingly • Carryout meeting arrangements according to the time • Record the minutes of the meeting				
LU3. Decision making at workplace	**The trainee is able to:**				
LU4. Set and meet own work priorities at instent	**The trainee is able to:** • Take initiative to prioritize and facilitate competing demands to achieve organizational goals and objectives • Use technology efficiently and effectively to manage work priorities and commitments • Maintain appropriate work-life balance				
LU5. Devel	**The trainee is able to:**				

op and maintain professional competence	• Assess personal knowledge and skills against competency • Participate in networks to enhance personal knowledge, skills and work relationships • Seek feedback from employees, clients and colleagues to develop and improve competence				
LU6. Follow and implement work safety requirements	**The trainee is able to:** • Identify and report emergency incidents • Practice organizational policy and procedures for responding to emergency incidents • Identify and implement workplace procedures and work instructions for controlling risks				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Healthy work life balance

K2: Meeting terminologies, structures and arrangements

K3: Relevant organizational procedures and policies regarding meetings, chairing and minutes.

K1: Barriers to implement policies and procedures in an organization and possible strategies to address them.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to understand workplace policy and procedures. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-E
CBT Curriculum
National Vocational Certificate Level 4

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Module E: Perform Advanced Communication

Objective: This unit describes the performance outcomes, skills and knowledge required to develop communication skills used professionally. It covers plan and organise work and conduct trainings at workplace, along with demonstrating professional skills independently.

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Demonstrate professional skills	**The trainee is able to:** • Use different modes of communication to communicate a) Speaking b) Reading c) Writing d) Listening e) Presentation f) visual representation etc • Develop CV Skills according requirements • Upgrade professional skills by attending trainings, webinars, conferences etc. • Perform Continuous				

	professional development as required at workplace • Develop interview skills				
LU2. Plan and Organize work	**The trainee is able to:** • Identify task requirements. • Plan steps to complete tasks. • Review planning and organizing process. • Organize work.				
LU3. Provide trainings at workplace	**The trainee is able to:** • Assess the need for training • Prepare trainees for the learning experience • Present training session • Support trainees in managing their own learning • Facilitate group learning • Provide opportunity for practice • Provide feedback on progress on trainees • Review delivery experience				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

K1: Explaining the training skills

K2: Identification of the professional skills

K3: Describing the advanced language skills

K4: Understanding of the assessment and trainees feedback methods

K5: Direct and indirect communication methods

K6: Explaining the need of the training type at the work place

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Job sheet
- Office emails and coordination reports
- Feedback proforrma

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-F
CBT Curriculum
National Vocational Certificate Level 4

Version 1 - September, 2018

Module F: Develop Advance Computer Application Skills

Objective: This unit provides an overview of Microsoft Office programs to create personal, academic and business documents following current professional and/or industry standards, i.e. Data Entry, Power Point Presentation and managing data base and graphics for Design

It applies to individuals employed in a range of work environments who need to be able to present a set range of data in a simple and direct forms

Duration: 40 Hours **Theory: 08 Hours** **Practice: 32 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Manage Information System to complete a task	**The trainee is able to:** • Perform Data Entry in MS office • Manage File/folder in MS office • Perform Scanning of document • Maintain Office Record in drives • Perform Printing of document • Search required				

	Files/Folders • Convert Files in required formet. • Manage sizes of Files/Folders • Compress • Zip /unzip				
LU2. Prepare Presentation using computers	**The trainee is able to:** • Prepare presentation as per requirements, i.e. • Open blank presentation and add text / graphics • Create a simple design for a presentation • Apply existing styles within a presentation • Use presentation template and slides to create a presentation • Use various tools to improve the look of the				

	presentation • Save presentation to the appropriate storage device and folder with required name • Customize basic settings to meet user requirements • Format presentation as require • Develop organizational charts • Add objects and manipulate to meet presentation purposes • Modify slide layout, including text and colours, to meet presentation requirements • Save presentation in another format • Save to storage device				

	and close presentation • Add slide show effect into presentation as required to enhance the presentation • Incorporate pre-set Animation • Apply Multimedia effects • Record Narration • Apply hyperlink • Apply video • Rehearse Timings • Test presentation for overall effect • Print the presentation • Select appropriate print format for presentation • Select preferred slide orientation • Add notes and slide numbers • Preview slides and run				

	spell check before presentation • Print selected slides and submit presentation to appropriate person for feedback • Practice verbal presentation • Practice presentation through AV Aids				
LU3. Use Microsoft Access to manage database	**The trainee is able to:** • Collect the data using a standard data base package. • Start access to manage database .i.e. • identify problem statement of Data • Develop a table with fields /attributes according to database usage/ user requirements				

	• Create a primary key and establish an index for each table • Modify table layout and field attributes as required • Create a relationship between the two tables • Add data in a table according to information requirements • Add records as required • delete records as required • Save database to storage area • close down database to storage area • Apply criteria in the following Query • SQL view of Query				

	• Wildcards of query • Query Criteria • Customize basic settings: • Adjust page layout to meet user requirements • Open and view different toolbars • Format font as appropriate for the purpose of the database entries • Create reports • Design reports to present data in a logical sequence • Modify reports to include or exclude additional requirements • Distribute reports to appropriate person in a suitable format				

	• Create forms • Use a wizard to create a simple form • Open existing database and modify records through a simple form • Rearrange objects within the form to accommodate information requirements				
LU4. Develop graphics for Design	**The trainee is able to:** • Develop graphic design concepts based on a thorough understanding of the communication need • Use design techniques confidently to produce designs • Integrate design tools skillfully to produce designs				

	• Evaluate the success of completed designs to meet objectives • evaluate feedback from client / peers				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

K1: List basic technical terminology to read help files and prompts

K2: Outline the different types of formal and informal presentations

K3: Explain Power point presentation

K4: Segregation of Data

K5: Define the relation among data

K6: Define criteria in the query

K7: Creates and modify reports and forms.

K8: Outline basic database design principles

K9: Current graphic design software

K10: Discuss features of current and emerging technologies used in graphic design practice and the options they present for effective graphic design solution

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Design and develop a simple database using a standard database package
- Create, format and prepare presentations for distribution and display
- Customize basic settings
- Add slide show effects.
- Generate employment report from given data by using Microsoft Access.

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-G
CBT Curriculum
National Vocational Certificate Level 4

Version 1 - September, 2018

Module G:Manage Human Resource Services

Objective: This unit describes the skills and knowledge required to plan, manage and evaluate delivery of human resource services, integrating business ethics. It applies to individuals with responsibility for coordinating a range of human resource services across an organization. They may have staff reporting to them.

Duration: 20 Hours **Theory: 04 Hours** **Practice: 16 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Determine strategies for delivery of human resource services	**The trainee is able to:** • Analyze business strategy and operational plans to determine human resource requirements • Review external business environment that likely impact on organization's human resource requirements • Consult line and senior managers to identify human				

	resource needs in their areas • Review organization's requirements for diversity in the workforce • Deliver human resource services that comply with business goals • Develop strategic action plan for delivery of human resource services • Develop roles and responsibilities of human resource team • Develop quality assurance policy				
LU2. Manage the delivery of human resource services	**The trainee is able to:** • Communicate human resource strategies and services to internal and external				

	stakeholders • Develop and negotiate service agreements between a. The human resource team, b. Service providers c. Client groups • Document service specifications, performance standards and timeframes • Document /communicate service • Specifications, • Performance standards • Timeframes • Monitor Quality assurance processes • Ensure that services are delivered by appropriate providers,				

	according to service agreements and operational plans • Identify underperformance of human resource team or service providers				
LU3. Evaluate human resource service delivery	**The trainee is able to:** • Establish Management information system for human resource services • Conduct survey to determine level of satisfaction • Analyze feedback of survey • Recommend changes to service delivery • Support agreed change processes across the organization				

LU4. Manage integration of business ethics in human resource practices	**The trainee is able to:** • Ensure ethics in personal behavior • Ensure code of conduct is observed across the organization, • Observe confidentiality requirements in dealing with all human resource information • Deal promptly with unethical behavior • Ensure all persons responsible for human resource functions understand requirements regarding their ethical behavior				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Identify the key provisions of legal and compliance requirements that apply to managing human resources

K2: Summarize the organization's code of conduct

K3: Explain human resource strategies and planning processes and their relationship to business and operational plans

K4: Describe performance and contract management

K5: Explain how feedback is used to modify the delivery of human resources.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to manage human resource services. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

- Plan and manage human resource delivery within legislative, organizational and business ethics frameworks
- Communicate effectively with a range of senior personnel
- Identify and arrange training support where appropriate
- Calculate human resource return on investment within the organization.

ELECTRICAL MACHINE WINDING TECHNICIAN

Module-H
CBT Curriculum

National Vocational Certificate Level 4

Version 1 - September, 2018

ModuleH: Develop Entrepreneurial Skills

Objective: This Competency Standard identifies the competencies required to develop entrepreneurial skills, in accordance with the organization's approved guidelines and procedures. You will be expected to develop a business plan, collect information regarding funding sources, develop a marketing plan and develop basic business communication skills. Your underpinning knowledge regarding entrepreneurial skills will be sufficient to provide you the basis for your work.

Duration: 30 Hours **Theory: 06 Hours** **Practice: 24 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Develop a business plan	**The trainee is able to:** • Conduct a market survey to collect following information a. Customer /demand b. Tools, equipment, machinery and furniture with rates c. Raw material d. Supplier e. Credit / funding				

	sources f. Marketing strategy g. Market trends h. Overall expenses i. Profit margin • Select the best option in terms of cost, service, quality, sales, profit margin, overall expenses • Compile the information collected through the market survey, in the business plan format				
LU2. Collect information regarding funding sources	**The trainee is able to:** • Identify the available funding sources based on their terms and conditions, maximum loan limit, payback time, interest rate • Choose the best available option according to investment				

	requirement • Prepare documents according to the loan agreement requirement • Include the information of funding sources in the business plan				
LU3. Develop a marketing plan	**The trainee is able to:** • Make a marketing plan for the business including product, price, placement, promotion, people, packaging and positioning • Include the information of marketing plan in the business plan				
LU4. Develop basic business communication skills	**The trainee is able to:** • Communicate with internal customers e.g.: labor, partners and external customers e.g.:				

	suppliers, customers etc., using effective communication skills • Use different modes of communication to communicate internally and externally e.g.: presentation, speaking, writing, listening, visual representation, reading etc. • Use specific business terms used in the market				

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Explain the 7ps of marketing including product, price, placement, promotion, people, packaging and positioning

K2: Describe 7Cs of business communication

K3: Define different modes of communication and their application in the industry

K4: Enlist specific business terms used in the industry

K5: Enlist the available funding sources

K6: Explain how to get loan to start a new business

K7: Explain market survey and its tools e.g: questionnaire, interview, observation etc

K8: Describe the market trends for specific product offering

K9: State the main elements of business plan

K10: Explain how to fill the business plan format

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to develop Entrepreneurial Skills.

Performance requirements

- Conduct market survey and formulate business plans in terms of feasibility, investment potential, risk, and completeness.
- Demonstrate the use of both verbal and non-verbal business communication.
- Effectively present business ideas and profile

5. Complete List of Tools, Equipment, Machines and Consumables

Worker traits	**Entry Requirements**	**Duration of training required**	**Career paths**
• Able-Bodied • Strong • Devoted • Motivated • Hard Working • Honest • Punctual • Knowledgeable • Friendly • Interpersonal Skills	• Minimum Primary and Preferably Middle/Matric **Trainer** • Transformer and Motor Winding Technician (Level 4) with	Total contact Hrs 1800 Or Credit hours. 180	• Motor Winding Technician • Transformer Winding Technician • Self-Owned Workshop/Entrepreneur • Trainer • Assessor • Electrical Machine Winding Expert

• Creative • Team Worker • Collaborative • Confident • Competent • Innovative • Cooperative	5 Years relevant field Experience • DAE Electrical with 3 Years relevant field Experience • BS Tech Electrical with 2 Years relevant field Experience • BSc Engineering Electrical with 1 Year relevant field Experience		**Future Trends** The paradigm shift of life style from simple to mechanized one is witnessing immense increase in the demand of electrical machines. The subsequent repair/rewinding work of the machines has been creating more opportunities /jobs prospects for the skilled workers in the trade of Electrical Machines Winding Technicians.

Related Knowledge	Tools / Equipment
• Basic Concept of Electricity and Magnetism • Define Voltage, Current, Resistance, Power& Energy • Define DC and AC (Single Phase,Three Phase) • Define Ohm's Law, calculation using basic ohm's law formula • Knowledge of Basic Electric Circuits(Series, Parallel, Open, Close, Ground, Short) • Define Conductors, Insulators, Semiconductors • Understanding Laws of Resistance • Concept of Voltage Drop • Define frequency, conductance, inductance, capacitance, impedance, power factor • State disadvantages of low power factor and methods of improvement of	• Combination Pliers 8" • Long Nose Pliers 6" • Flat Nose Pliers 6" • Round Nose Pliers 6" • Screw Driver Set (Flat & Phillips) Size 4", 6",8",10",12" • Tweezers of different shapes & sizes 4", 6" • Hammer (200,500,1000) grams • Mallet / Rubber Hammer (200,500) grams • Cold Chisel 8",12" • Gas Welding Plant • Winding Machine ➢ Manual (Small and Large size) ➢ Motorized ➢ Automatic • Elenkey Set size 1 – 10 mm • Bench Vice size 4", 6" • Digital Weight Balance up to 500 KG • Oven 0- 300ºC, 3 Cubic Ft inner chamber size, 230 V 50 Hz (For Drying purpose of

Related Knowledge	Tools / Equipment
power factor • Define self and mutual induction • Knowledge of Star Delta Connections and relation between phase and line quantities • Define Electrical measuring Units • Use of Measuring Instruments (Voltmeter, Ampere-meter, Ohm meter, wattmeter, multi-meter, Insulation Tester (Megger), TTR Meter, Clamp on Meter, Tachometer, Growler, Phase sequence meter Energy meter, Power factor meter, LCR meter, Frequency meter etc.) • Use of CT and PT in measurements • Know about Tagging , Padlocking and Coupling Techniques • Define motor, Working principle and types • Define starting and running current / torque of motor	Winding) • Scriber 6” • Center Punch 4”,6” • Vernier Caliper size 8”(Digital / Analog) • Standard Wire Gauge • Micrometer 0-25 mm , 1” (Digital/Analog) • Steel rule (300mm & 1M) • Steel Measuring Tape 10M • Try Square (8”,12”) • Bearing Puller (4”,6”,12”) • Grease Gun (12”) • Oil Can (6”) • Ratchet Type Spanner Set 4mm – 36mm • Adjustable screw wrench (6”,8”,12”) • Pedestal Drill Machine ½″ Chuck, 4 Ft • Portable Electric Drill Machine ½″ Chuck • Hi Carbon Steel Drill Bit Set (1mm-12mm) • Tap & Die Set (3mm-12mm) • Stators Iron core of motor without winding (24,30,32,36,48 Slots) • Pedestal Fan Motor (Assorted No of Slots)

Related Knowledge	Tools / Equipment
• Define cork screw rule, Lenz law, Fleming left and right hand rules • Define transformer, Its working principle and types • Define transformer turn ratio (TTR) and nominal transformation voltage ratio • Define vector group of transformer winding • Define different types of motor winding diagrams (Lap, Wave, Chain and set) • Draw different types of motor winding diagrams (Lap, Wave, Chain and set) • Importance of Machine Inventory at workplace • Importance of preventive maintenance of machines • Use of Tri Pod and Chain Block • Adjustment / fasten techniques of tri pod and chain block • Describe Safe transportation techniques of Machines through loader	• Ceiling Fan Motor (Assorted No of Slots) • Soldering Iron (60watt,100watt,200watt) • Soldering Gun 100 Watt or above • Blow Lamp • Regulator Core Laminations • Transformer Core (Core Type, Shell Type)1KVA,5KVA • Transformer Single Phase 1KVA • Transformer Three Phase 10KVA • Single Phase Variable Transformer (Variac 0-250V,2KVA) • Three Phase Variable Transformer (Variac 0-500V,5KVA) • Tri Pod 10 feet with Chain Block1 Ton • Single Phase TTR Meter • Transformer Testing Module • Digital Insulation Tester (Megger), (Multi Range) • Transformer Oil Testing Equipment • Welding Plant (5KVA) • Digital Clamp on Meter • Digital Multi Meter • Pipe Wrench (8”,12”,18”) • Grip Pliers (8”) • Pliers for locking / unlocking Spring washer

Related Knowledge	Tools / Equipment
/ fork lifter • Importance of Numbering for position of machine parts • Importance of marking for adjustment / alignment of Machine Parts • Estimation and Costing of repair / replacement work • Importance of Safe storage of Machines and Materials • Filtration techniques of Transformer oil • Know about quality standards of transformer oil • Testing techniques of Transformer oil • De-hydration of transformer oil • De Hydration of Silica Gel • Importance of Tap Changer of Transformer • State procedure of Removing Faulty Winding Coils • State Procedure of Preparing Winding Coils	(Inner / Outer) • Air Compressor with Pneumatic Gun • Dust Blower • Coil Former Adjustable (6",8",10",12",18") Equal and Unequal size • Hacksaw 12" • Flat File 12" • Half Round File 12" • Round File 8" • Triangular File 8" • Tachometer (0-5000 rpm) Digital / Analog • Temperature laser gun • Pressure Gauge • Power Analyzer • Testing Bench • Growler • Portable Voltmeter 0- 500V AC/DC Digital / Analog • Portable Ammeter 0- 30A AC/DC Digital / Analog • Portable Wattmeter 0- 500W AC/DC Digital / Analog • Portable Frequency meter 0- 100Hz Digital / Analog • Portable Power Factor meter 0.5-0- 0.5 Lead / Lag Digital / Analog • Phase Sequence Meter 500 V

Related Knowledge	Tools / Equipment
• Importance and use of latheroid Paper, varnish, Coil binding, Sleeving • Understanding of Jointing, soldering and taping techniques of coils • Importance of coils baking • Importance of Winding Test at different stages • Understanding of Coil fastening, assembling and disassembling Techniques • Use of Winding Machine (Manual and Automatic) • Understand Preparation and Setting of Coil Former • Know about adjustment techniques for insertion of coils in core slots, core limb • Importance of Wedges • Understand construction features of Motors and Transformer • Importance of Data plate reading of machines	• High Voltage Probe • Digital Energy Meter Single and Three Phase • LCR Meter • Electrician Knife Cutter • Thimble Press 1.5mm^2 to 16mm^2 • Thimble Press (Hydraulic) 16mm^2 to 300mm^2 • Phase Tester • Wire / Cable Cutter 8” • Wire Stripper 6”

Related Knowledge	Tools / Equipment
• Importance of using PPE’S	

6. List of Consumables

	➢ Handbooks ➢ Design books ➢ Pencils ➢ Rubber ➢ Sharpeners ➢ Paper Cutter ➢ Seizers ➢ Colours ➢ White charts ➢ Brown sheets ➢ White board markers ➢ Permanent markers ➢ File cover and files ➢ Latheroid Paper Size 7, 10 & 12 No. ➢ Milinex Paper Size 7, 10 & 12 No. ➢ Nomex Paper Size 7, 10 & 12 No. ➢ Sleeve Size 1 to 14 No. ➢ Soldering Wire ➢ Soldering Flux ➢ Soldering Paste ➢ Cotton Tape ½" – 2" ➢ Glass Tape ½"- 2" ➢ Binding Thread ➢ Varnish (Non Conductive) ➢ Lugs ➢ Thimble ➢ Cable Paper 0.06mm

	➢ Press Pan Paper 0.1mm - 0.7mm ➢ Press Pan Sheet 1mm – 4mm ➢ Grease ➢ Kerosene oil ➢ Mobil Oil ➢ Transformer Oil ➢ Silica Gel ➢ Glue ➢ Wedges ➢ Cork Sheet ➢ Copper Winding Wire 18 to 34 SWG ➢ Sand Paper 1, 1.5 No. ➢ Electronic Contact Cleaner ➢ W D 40 Spray Tin ➢ Safety Goggles ➢ Electrical Safety Gloves ➢ Heat Resistance Gloves ➢ Washing Gloves ➢ Working Gloves ➢ Cotton Gloves ➢ Safety Shoes (Antistatic) ➢ Working Apron ➢ Dust Mask

	➢ Safety Helmet ➢ Safety Ladder ➢ Safety Belt ➢ Safety Rubber Mat 10- 20mm ➢ PVC Flexible Cable 23/0.0076”&40/0.0076” ➢ PVC 3/0.029”Cable ➢ PVC 7/0.029” to 7/0.064” Cable

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