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GENERATOR MECHANIC

CBT Curriculum

National Vocational Certificate Level 1

Version 1 - November, 2019

NAVTTC

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Contents

Introduction

Generators are machines that transform mechanical energy into electrical energy; they can be used to run a variety of electrical appliances for home or commercial use. There are numerous types of generators; some rely on natural gas, diesel or petrol as energy sources. This generator mechanic course is provided to train the unskilled trainees to service/repair/install engines and generators for home or industrial use. This course is aimed at introducing and developing the basic skills with an understanding of different energy sources, power quality and its influences on standby generator sets, different loads, startup and running of a standby generator. Set, size and select the most appropriated standby generator set of the application and provide the trainees with electrical and electronic principles to enable effective fault finding of the standby generators and associated systems alongside the installation of different types of generators. The trainees are encouraged to experiment with a focus on acquiring a wide range of new skills. They are also exposed to the commercial market and taught how to deal with clients and their demands.

In order to improve the quality of training and to ensure relevance, National Vocational & Technical Training Commission (NAVTTC) through Qualification Development Committee (QDC) developed National Competency Standards for generator mechanic. The learning outcomes provided in this curriculum form the basis of this instruction, which are in accordance with the approved National Competency Standards for generator mechanic. The curriculum can be implemented in a variety of pathways and provides flexible learning opportunities.

Purpose of the Training Programme

In this training program trainee will learn and acquire specialized knowledge and particle skills required to function as a Generator Mechanic both at public and private levels. The specific objectives of developing these qualifications are as under:

- Improve the overall quality of training delivery and setting national benchmarks for training of generator mechanic in the country
- Provide flexible pathways and progressions to learners enabling them to receive relevant, up-to-date and current skills

- Provide basis for competency-based assessment which is recognized and accepted by employers
- Establish a standardized and sustainable system of training for generator mechanic in the country.

Overall objectives of the course

The prime objective of this one-year certificate in Generator mechanic is to provide the trainee with a comprehensive introduction and skill oriented practical work of generator at workplace. It develops trainee's abilities, interests and offers an outstanding opportunity for an intense engagement with various stages of installation, overhauling, maintenance work of generator. It encourages individual creativity while giving a solid ground in terms of identification of faults, maintenance of faulty parts, overhauling, earthing and installation alongside the skill to perform winding, work plan, documentation and develop professionalism by using appropriate technology. Part of the task is to help the trainees realize their commercial viability as an independent generator mechanic or an employee in a commercial setup. They are also made aware of the ever changing and evolving demands and challenges of market trends. This course is open to students of all levels and experiences under following main objectives.

Competencies to be gained after completion of course

The detail of the competency standards included in this qualification are given below:
National Vocational Certificate level 1, in "Generator Mechanic"

1. Comply with Work Health and Safety Policies
2. Obey the Workplace Policies and Procedures
3. Follow Basic Communication Skills (General)
4. Operate Computer Functions (General)
5. Identify Tools and Equipment
6. Identify Generators & its Components

Job opportunities available immediately and in the future

The Pass outs of this course may find job / employment opportunities in the following areas:

- Work as Generator Mechanic Helper (Level 1)

Trainee Entry Level:

The entry for National Vocational Certificate level 1, Generator Mechanic is given below:

Title	Entry requirements
National Vocational Certificate level 1, in Generator Mechanic	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 (Grade 8) or equivalent.

Minimum Qualification of Trainer

- 2 years of teaching/ professional relevant experience after Diploma
- 1 year of teaching/ professional experience after B-Tech/ BSc Engineering

Recommended Trainer: Trainee ratio

The recommended trainer and trainee ratio are 1:24 per class

Medium of Instruction:

Urdu, English or Local Language

Duration of course (total time, Theory & Practical)

The proposed curriculum is composed of **06** modules that will be covered in **240** hrs. It is proposed that the course may be delivered in a **Three months** period. The distribution of contact hours is given below:

- **Theory:** (23.33%) **Practical** (76.67%)
- **Theory: 56 hours**
- **Practical: 184 hours**
- **Total: 240**

11. Sequence of the modules

Following is the structure of the course:

NVQF Level	Module #	Title	Category	Theory (hours)	Practical (hours)	Total (hour)	Credits hours	Total Credit Hours
1	1	Comply with Work Health and Safety Policies	Generic	06	24	30	03	24
	2	Obey the Workplace Policies and Procedures	Generic	04	16	20	02	
	3	Follow Basic Communication Skills (General)	Generic	10	40	50	05	
	4	Operate Computer Functions(General)	Generic	10	40	50	05	
	5	Identify Tools and Equipment	Technical	16	34	50	05	
	6	Identify Generators & its Components	Technical	10	30	40	04	
TOTAL				56	184	240	24	24
Percentage.				23.33%	76.67%			

Overview of the Curriculum

Summary – Overview of the curriculum

Module Title and Aim	Learning Units	Theory hours	Workplace hours	Timeframe of Modules
Module 1: **Comply with Work Health and Safety Policies** **Aim:** After completing this module, the learner will be able to know skills and knowledge required to apply general work health and safety requirements in the workplace. Communicate work and health safety assess at work place. It describes generic work health and safety responsibilities applicable to employees without managerial or supervisory responsibilities.	**LU-1:** Work safely at work place **LU-2:** Communicate work health and safety (WHS) assess at work place **LU-3:** Minimize risks to personal safety at work place **LU-4:** Minimize risks to public safety	**06**	**24**	**30**
Module 2: **Obey the Workplace Policies and Procedures** **Aim:** After completing this module, the learner will be able to obey the workplace personal appearance and hygiene, follow work ethics, Demonstrate the workplace behavior, Communicate the workplace policy and procedure and review the implementation of workplace policy and procedures.	**LU-1:** Obey the workplace personal appearance and hygiene **LU-2:** Follow work ethics **LU-3:** Demonstrate the Work place behaviors **LU-4:** Communicate workplace policy & procedures **LU-5:** Review the implementation of workplace policy & procedures	**04**	**16**	**20**

Module 3: **Follow Basic Communication Skills (General)** **Aim:** After completing this module, the learner will be able to listen attentively, develop non-verbal communication, and identify communication barriers, interview preparation for job and different communication platforms in the workplace and throughout your career.	**LU-1:** Adopt Effective listening to Skills **LU-2:** Develop Nonverbal communication with peers **LU-3:** Prepare for Interview to get a job **LU-4:** Use communication platform at workplace **LU-5:** Identify communication barriers to improve interpersonal skills	**10**	**40**	**50**
Module 4: **Operate Computer Functions (General).** **Aim:** After completing this module, the learner will be able to have skills and knowledge required to setup a computer system, organize files in folders, and shutdown a computer system.	**LU1.** Set up the computer for use **LU2.** Organize files in folder **LU3.** Shut down computer system	**10**	**40**	**50**
Module 5: **Identify Tools & Equipment** **Aim:** After completing this module, the learner will be able to arrange tools/equipment, maintain tool box, calibrate measuring tools and manage proper inventory of used/unused tools/equipment	**LU1:** Arrange Tools and Equipment **LU2:** Maintain Tool Box **LU3:** Insulate Tools and Equipment **LU4:** Calibrate measuring tools **LU5:** Manage Inventory of tools and equipment	**16**	**34**	**50**
Module 6: **Identify Generators & its Components** **Aim:** After completing this module, the learner will be able to identify generator and its engine parts, identify components/attachments, identify capabilities of Generator and Identify basic tools and supplies	**LU1**. Identify generator and its engine **LU2.** Identify components & attachments **LU3**. Identify capacity of generator **LU4.** Identify capabilities of generator **LU5**. Identify basic tools and supplies associated with generator	10	30	40
	TOTAL	**56**	**184**	**240**

GENERATOR MECHANIC

Module-5

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Detail of Modules

Module 5: Identify Tools & Equipment

Objectives: After completing this module, the learner will be able to arrange tools/equipment, maintain tool box, calibrate measuring tools and manage proper inventory of used/unused tools/equipment

Duration:	**Total hours**	**50**	**Theory**	**16**	**Practical**	**34**

Learning Unit	**Learning Outcomes**	**Learning Elements**	**Duration**	**Materials (Tools & Equipment) Required**	**Learning Place**
LU1. **Arrange Tools and Equipment**	• Identify tools and equipment • Interpret job card • Prepare list of tools and equipment as per requirement • Collect tools and equipment from store	• Describe functions of different tools • Knowledge about job card • Knowledge of tools for specific task	3 hours Theory 6 hours Practical	• Tools • Job card	Class Room and workplace
LU2. **Maintain Tool Box**	• Check physical conditions of tools and equipment before use • Perform preventive maintenance as per standards • Perform corrective maintenance of	• Describe arrangements of tools and equipment in tool box • Describe corrective and preventive maintenance	3 hours Theory 6 hours	Tool Box	Class Room and workplace

	tools as per requirements • Clean tools and equipment after use • Place tools and equipment at appropriate place		Practical		
LU3. **Insulate Tools and Equipment**	• Select insulated tools and equipment • Adopt insulated tools and equipment as per standards	• Define insulation • Describe importance of insulated tools and equipment	3 hours Theory 6 hours Practical		Class Room and workplace
LU4. **Calibrate measuring tools**	• Check calibration status of the measuring tools • Perform calibration of measuring tools as per standards • Record calibration test results	• Define calibration • Describe types of calibration • Describe methods of equipment calibration	4 hours Theory 8 hours Practical	Testing Instruments as per requirement	Class Room and workplace
LU5. **Manage Inventory of tools and equipment**	• Check tools and equipment as per record • Report for faulty tools and equipment to supervisor • Generate demand for deficit tools and equipment • Maintain all records of tools and equipment	• Explain methods of tools and equipment inventory control • Elaborate writing of faulty tools and equipment • Knowledge about stock and dead stock record	3 hours Theory 8 hours Practical	Inventory Book/ Register	Class Room and workplace

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Module-6

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Module 6: Identify Generators & its Components

Objectives: After completing this module, the learner will be able to identify generator and its engine parts, identify components/attachments, identify capabilities of Generator and Identify basic tools and supplies

Duration:	**Total hours**	**40**	**Theory**	**10**	**Practical**	**30**

Learning Unit	**Learning Outcomes**	**Learning Elements**	**Duration**	**Materials (Tools & Equipment) Required**	**Learning Place**
LU1. **Identify generator and its engine**	• Identify petrol engine • Identify diesel engine • Identify gas engine	• Describe Petrol engine and its functions • Describe Diesel engine and its functions • Describe Gas engines and its functions	2 hours Theory 6 hours Practical	• Petrol generator engine • Diesel generator engine • Gas generator engine	Class Room and workplace
LU2. **Identify components &**	• Identify alternator	• Define alternator • Define fuel pump		• Alternator	Class Room and

attachments	• Identify fuel pump • Identify water pump • Identify radiator • Identify turbo charger/inter cooler	• Define water pump • Define radiator • Define functions of turbo charger/intercooler	2 hours Theory 6 hours Practical	• Fuel pump • Water pump • Radiator • Turbo charger/inter cooler	workplace
LU3. **Identify capacity of generator**	• Check capacity as per manufacturer's specification • Ensure proper capacity of generator	• Define generator capacity • Explain specification of different generator sets	2 hours Theory 6 hours Practical	• Generator manual	Class Room and workplace
LU4. **Identify capabilities of generator**	• Check capability as per manufacturer's specification • Ensure proper capability of generator as per rating • Report to supervisor as per format	• Describe HP, CC and KW/KVA • Explain basic conversion techniques between HP, CC, and KW/KVA • Understand calculation to find CC, HP, KW/KVA	2 hours Theory 6 hours Practical	• Generator manufacturing Manual	Class Room and workplace
LU5. **Identify basic tools and supplies associated with generator**	• Check standard tools supplies with generators • Check spare/consumable materials • Adopt manufacturer's specifications of tools and equipment	• Knowledge about basic tools and supplies • Knowledge about spare/consumable materials • Knowledge about tools/equipment as per specification	2 hours Theory 6 hours Practical	• Generator tool kit	Class Room and workplace

List of Tools and Equipment

Sr. No	A. Testing instruments	Quantity,24-25 students
1.	Volt meter	10
2.	Clamp on mater	10
3.	Phase sequence meter	10
4.	Pressure gauge (oil)	10
5.	vacuum gauge	10
6.	PH meter	10
7.	Growler	10
8.	Bench power supply (variable DC)	5
9.	Megger/insulation tester,	10
10.	Frequency meter	10
11.	Temperature mater	10
12.	Tachometer	10
13.	Watt meter	10
14.	Multimètre	10
15.	Power factor meter	10
	Tools and Equipment	
1.	Timing light	5

2.	Engine analyzer	5 set
3.	Electronic Fuel Injection (EFI) engine diagnostic scanner	2
4.	Compression gauge	10
5.	Cylinder leakage tester	10
6.	Fuel injection test device	5
7.	Fuel injector pressure tester	5
8.	Glow plug analyzer	10
9.	Smoke diagnostic tool kit	10
10.	Heat gun	10
11.	Torque wrench	15
12.	Open end spanner set	15
13.	Combination spanner set	15
14.	Ring spanner set	15
15.	Socket box	15
16.	Adjustable screw wrench set	15
17.	Vice grip pliers	15
18.	Universal pliers	15
19.	Nose pliers	15
20.	Combination pliers	15
21.	Inside circlip pliers	15
22.	Outside circlip pliers	15
23.	Bearing puller inside	15
24.	Bearing puller outside	15
25.	Ring installer	15
26.	Ring remover	15
27.	Ridge remover	15
28.	C clamp	15
29.	Ring compressor	15
30.	Hammer set(steel)	15
31.	Hammer set (plastic/rubber)	15
32.	Allen key set	15
33.	Screw driver set (star, flat)	15
34.	Feeler gauge	15
35.	Micrometer	15
36.	Vernier caliper	15

37.	Winding machine	10
38.	Hydrometer	15
39.	Bench vise	10
40.	Hand hacksaw frame	25
41.	Scriber	25
42.	Scraper (triangular & flat)	25 set
43.	Surface gauge	10
44.	Surface plate	10
45.	Air blower	10
46.	Hand drill machine	10
47.	Oil cane	15
48.	valve re-facer machine	2
49	Filter chain	25
50.	Oil drain plug spanner	25
51.	Spark plug spanner	25
52.	Hand grinder machine	5
53.	Tap and die set (inch & millimeter)	25 set
54.	Nipple forming set	25
55.	Tri square	25
56.	Hand file set	25
57.	Needle file set	25
58.	Cross cut chisel	25
59	Flat chisel	25
60.	Round chisel	25
61.	Centre punch	25
62.	Pin punch set	25
63.	Insulation remover	25
64.	Thimble press	25
65.	Funnel	25
66.	Pipe wrench set	10
67.	Portable petrol and diesel generator	5
68.	Label maker (wire, tape, plastic)	10 Dozen
69.	Soldering iron (25W & 100 W)	15
70.	Lifts (scissor, Paper cutter)	25
71.	Air compresser with full accessoires	2

72.	Personale Protective Equipment	25
73.	High voltage gloves, (rubber and leather)	25
74.	Materials safety Data Sheets (MSDS)	25
75.	Temperature sensor	25
76.	Tool box (23 pieces)	25
77.	Tool belt (13 pieces)	25
78.	Silicone gun	25
79.	Heat sensor	25
80.	Oil pressure sensor	25
81.	RPM sensor/magnetic pickup	25
82.	Mallet	25
	Rawhide mallet	25
83.	Battery (200 Ah) and battery charger	2 each
84.	Hydraulic jack (portable, 200kg)	5
85.	AVR	10
86.	Fuel solenoid switch	10
87.	Tool trolley	5
	LIST OF CONSUMABLE SUPPLIES	
1.	Spark plug	10 Dozen
2.	Atomizer nozzle	24
3.	Filter (air, oil, fuel, water)	10
4.	Lubricants	5 *4
5.	Overhauling kit	5
6.	Belts different sizes	50
7.	Bearings different sizes	50
8.	Radiator hose pipes	15
9.	Engine alternator foundation	15
10.	Bridge set/diode plates	25
11.	Enamel copper wire different SWG	5 KG each
12.	Insulation paper with different SWG	10 KG each
13.	Varnish	10 liters

14.	Wire sleeves different sizes	100 No. each
15.	Valve lapping stick	25
16.	Emery pastes	10 tin
17.	Emery paper different sizes	25 No. each
18.	Slip rings	10
19.	Carbon brushes different sizes	15 set each
20.	Insulation taps	200.No
21.	Cables (3/29, 7/29,7/36, 4)	300 meter each
22.	Cables (7/44, /7/52,7/64) etc.	300 meter each
23.	Flexible cable different sizes	200 meter each
24.	Multi core cables different sizes	100meter each
25.	Cotton tap	100 No.
26.	Flexible pipes	10
27.	Circuit breaker different rating	50
28.	Relays	25
29.	Selector switch	25
30.	Bulbs	50
31.	Fuses different rating	50 No. each
32.	Magnetic contactor different rating	5 No. each
33.	Penal box	5
34.	High tension lead	15 set
35.	High tension tap	15 set
36.	Soap	25 No
37.	Detergent etc.	25 No
38.	Cotton waste	10 Dozen

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