



Co-funded by the European Union



Norwegian Embassy
Islamabad



ROBOTICS TECHNICIAN



© TVET SSP

CBT Curriculum

National Vocational Certificate Level 2

Version 1 - October, 2019



Implemented by

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

Published by

National Vocational and Technical Training Commission
Government of Pakistan

Headquarter

Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
www.navttc.org

Responsible

Director General Skills Standard and Curricula, National Vocational and Technical Training Commission
National Deputy Head, TVET Sector Support Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Layout & design

SAP Communications

Photo Credits

TVET Sector Support Programme

URL links

Responsibility for the content of external websites linked in this publication always lies with their respective publishers. TVET Sector Support Programme expressly dissociates itself from such content.

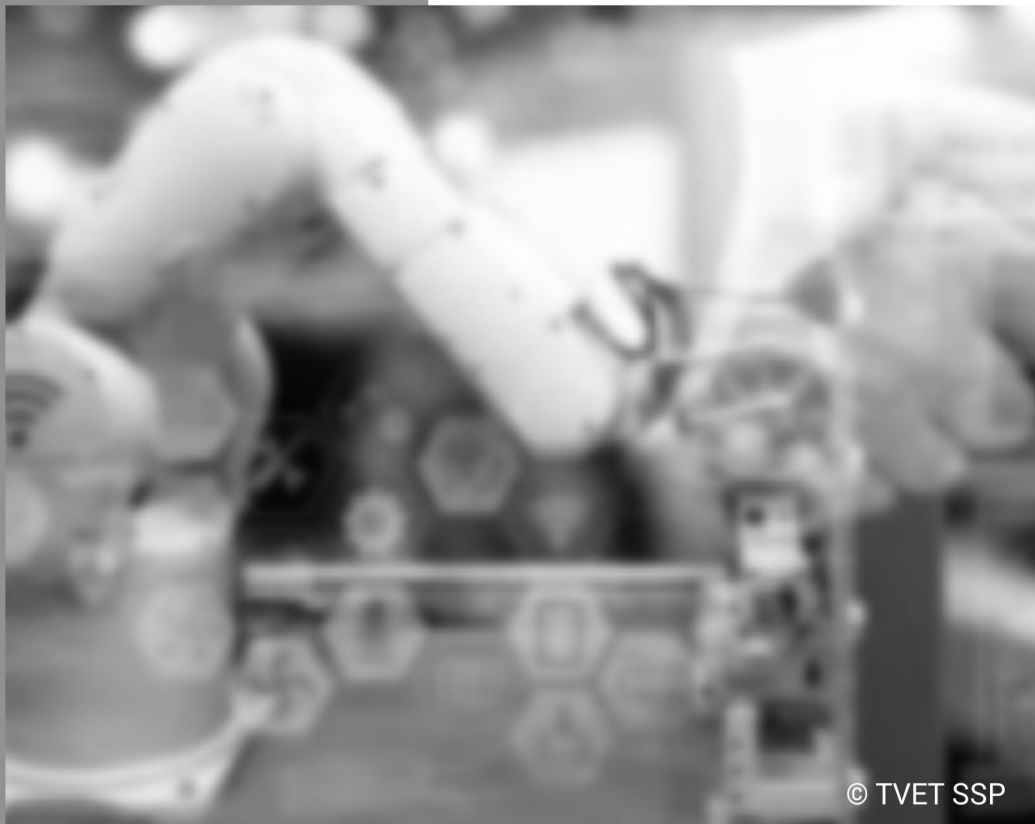
This document has been produced with the technical assistance of the TVET Sector Support Programme, which is funded by the European Union, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs)s and private sector organizations.

Document Version

October, 2019

Islamabad, Pakistan

ROBOTICS TECHNICIAN



CBT Curriculum
National Vocational Certificate Level 2

Version 1 - October, 2019

Introduction	5
Definition/ Description of the training program for Robotics Technician	5
Purpose of the training program	6
Overall objectives of training program	6
Competencies to be gained after completion of course	7
Possible available job opportunities available immediately and later in the future	7
Trainee entry level	8
Minimum qualification for trainer	8
Recommended trainer: trainee ratio	8
Medium of instruction i.e. language of instruction	8
Duration of the course (Total time, Theory & Practical time)	8
Sequence of the modules	10
Summary – overview of the curriculum	11
Module: 0714001055 Identify security arrangements for robotics equipment	14
Module: 0714001056 Operate Robots at workplace	17
General assessment guidance for Robotics Technician	21
Complete list of tools and equipment	23
Credit values	27

Introduction

Definition/ Description of the training program for Robotics Technician

In order to build the capacity of technical and vocational training institutes in Pakistan through provision of demand driven competencies-based trainings in Electronics sector the NAVTTC, and TEVT Sector Support Program (TSSP) have joined hands together to develop qualifications for Electronics sector. These qualifications will not only build the capacity of existing workers of this sector but also support the youth to acquire skills best fit for this sector. The benefits and impact of development of these qualifications will be on both demand and supply side.

This Curriculum is meant for individuals striving to enter the field of “Robotics Technician”. This course builds the basic qualification that is essential for any robotics technician to effectively carry out their duties.

The curriculum will provide students with the necessary knowledge and skills to operate robots and robotic systems in an industrial setting as well as to monitor their operation. The students will have sufficient understanding to deploy, commission, test and maintain robots and robotics systems.

Trainees will also learn how to perform assembly of robots and robotics systems along necessary configuration and up-gradation. Trainees will develop essential understanding which will enable them to troubleshoot robots and robotics systems whenever the need arises.

This course will also cover essential soft skills such as project management, quality assurance, health and safety etc. enabling the individual to become an asset for their organization.

Objectives

The specific objectives of developing these qualifications is as under:

- Develop basic knowledge and understanding which enables trainees to operate robots and robotic systems effectively
- Have the necessary understanding to effectively monitor and coordinate robots and robotic systems
- Enable trainees to properly maintain and troubleshoot robots
- Perform initial deployment and commissioning of robotic systems
- Acquire necessary skills to assemble and test robots and robotics systems
- Have sufficient knowledge to carry out configuration of robots and robotic systems as well as up-gradation of said system

Based upon this demand of industry these competency-based qualifications for ROBOTICS TECHNICIAN are developed under National Vocational Qualification Framework (NVQF) (Level 1 to 4). The qualifications mainly cover competencies along with related knowledge and professional skills which are essential for getting a job or self-employed.

The 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 (NAVTTTC) has approved the Qualification Development Committee (QDC). The QDC consists experts from the relevant industries from different geographical locations across Pakistan and academicians who were consulted during the development process to ensure input and ownership of all the stakeholders. The National Competency Standards could be used as a referral document for the development of curricula to be used by training institutions.

Purpose of the training program

The competency based NVQ has been developed to train the unskilled youth of Pakistan on the technical and administrative skills to be employed and sustain impact on their livelihood through income generation.

The purpose of these qualifications is to set professional standards for Robotics Technicians, who will serve as key agents to enhance quality of Pakistan's robotics, technology, and manufacturing industries.

Overall objectives of training program

The Robotics Technician qualifications level 1- 4 consists of theoretical and practical details required for Robotic Technician in Electronics industries. However, this will require providing additional input on entrepreneurship development for the one who is willing to start his/her own business. The main objectives of the qualification are as follows:

- Develop knowledge, skills and understanding related with basic and operational robotics functionalities that lead to and demonstrate conceptual and technical accomplishment
- Provide sound introduction about robotics technician technical, functional and generic skills
- Introduce the concepts of industrial robots and explains how they can be used in a plant or manufacturing system
- Support to acquire specialist knowledge and practical experience required for robotics technician
- Encourage trainees to test and explore different software and associated technical resources for knowledge, understanding and implementation
- Offers the wide range of interactive learning elements to provide trainees with a rich learning experience

Competencies to be gained after completion of course

At the end of the course, the trainee must have attained the following competencies:

National Vocational
Certificate Level-2
0714 E&A 021

Robotics Technician

(Junior Technician)

- Manage routine tasks at workplace
- Maintain inventory at workplace
- Identify security arrangements for robotics equipment
- Operate robots at workplace
- Distinguish equipment / components for assembling purpose
- Do component testing for robotics
- Un-deploy robot at workplace
- De-commission robot at workplace
- Follow Professional & technical knowledge about robotics
- Communicate the workplace policy and procedure
- Perform basic computer application (specific)
- Comply with personal health and safety guidelines
- Perform basic communication (specific)

1. Manage routine tasks at workplace
2. Maintain inventory at workplace
3. Identify security arrangements for robotics equipment
4. Operate robots at workplace
5. Distinguish equipment / components for assembling purpose
6. Do component testing for robotics
7. Un-deploy robot at workplace
8. De-commission robot at workplace
9. Follow professional & technical knowledge about robotics
10. Communicate the workplace policy and procedure
11. Perform basic computer application (specific)
12. Comply with personal health and safety guidelines
13. Perform basic communication (specific)

Possible available job opportunities available immediately and later in the future

Robotics Technician are employed in the light engineering sector especially in Electronics and Mechatronic sector. Experienced **Robotics Technician** may advance through promotions with the same employer or by moving to more advanced positions with other employers. They can become:

- Robotics Technician
- Robotics Technician (Jr. Supervisor)
- Robotics Technician (Junior Technician)
- Robotics Technician (Helper)

Trainee entry level

- Minimum Middle for level 1
- Minimum Middle for level 2
- Minimum 9th/Level-2 for level 3
- Minimum 9th/Level-3 for level 4

Minimum qualification for trainer

- Must hold DAE/Higher in (Electrical/Telecom/Electronics/Equivalent) with at least one years of experience in Robotic Industry.
- Or at least level 4 qualification in **(ROBOTICS TECHNICIAN)** with minimum 03 years of experience in relevant field.

Recommended trainer: trainee ratio

The recommended maximum trainer: trainee ratio for this program is 1 trainer for 20 trainees

Medium of instruction i.e. language of instruction

Instructions will be in Urdu/English/Local language.

Duration of the course (Total time, Theory & Practical time)

This curriculum comprises of 49 modules. The recommended delivery time is 2400 hours.

- Delivery of the course can therefore be full time (4 hours a business day), 6 days a week, for 24 months (on average 26 working days a month) for each level. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery. **OR**
- Delivery of the course can therefore be full time (5 hours a business day), 5 days a week, for 24 months (on average 22 working days a month). Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The full structure of the course is as follows:

Module	Theory hours	Workplace hours	Total hours
Manage routine tasks at workplace			30
Maintain inventory at workplace			20
Identify security arrangements for robotics equipment	13	27	40
Operate robots at workplace	14	36	50
Distinguish equipment / components for assembling purpose	10	30	40
Do component testing for robotics	10	30	40
Un-deploy robot at workplace	7	33	40
De-commission robot at workplace	4	36	40
Follow professional & technical knowledge about robotics			20
Communicate the workplace policy and procedure			20
Perform basic computer application (specific)			40
Comply with personal health and safety guidelines			30
Perform basic communication (specific)			30

Sequence of the modules

This qualification is made up of 13 modules. A suggested distribution of these modules is presented overleaf. This is not prescriptive and training providers may modify this if they wish.

The following technical module will be followed as require for the training purpose.

Module	Theory hours	Workplace hours	Total hours
Manage routine tasks at workplace			30
Maintain inventory at workplace			20
Identify security arrangements for robotics equipment	13	27	40
Operate robots at workplace	14	36	50
Distinguish equipment / components for assembling purpose	10	30	40
Do component testing for robotics	10	30	40
Un-deploy robot at workplace	7	33	40
De-commission robot at workplace	4	36	40
Follow professional & technical knowledge about robotics			20
Communicate the workplace policy and procedure			20
Perform basic computer application (specific)			40
Comply with personal health and safety guidelines			30
Perform basic communication (specific)			30

Each module covers a range of learning components. These are intended to provide detailed guidance to teachers (for example the Learning Elements component) and give them additional support for preparing their lessons (for example the Materials Required component). The detail provided by each module will contribute to a standardized approach to teaching, ensuring that training providers in different parts of the country have clear information on what should be taught. Each module also incorporates the industrial demand of Pakistan that make this qualification unique to Pakistan's industry needs.

Summary – overview of the curriculum

Modules

Module Title and Aim	Learning Units	Theory Days/ hours	Workplace Days/ hours	Timeframe of modules
Identify security arrangements for robotics equipment	LU1 Maintain Security logs LU2 Follow Relevant Security Protocols LU3 Audit Security Protocols	13	27	40
Operate Robots at workplace	LU1 Perform basic/initial test before operation LU2 Ensure Suitability of workplace for operation LU3 Follow standard procedures for operating the robot LU4 Perform post operation test	14	36	50
Distinguish equipment/components for assembling	LU1 Identify different components for	10	30	40

purpose	<p>assembly: LU2 Arrange components in order for assembly LU3 Identify tools/equipment for assembly LU4 Arrange tools/equipment for assembly LU5 Prepare workspace / environment for assembly</p>			
Do component testing for robotics	<p>LU1 Prepare testing work bench LU2 Identify SOPs for component testing LU3 Execute component test LU4 Report testing results LU5 Verify Calibration status of testing equipment</p>	10	30	40
Un Deploy robot at workplace	<p>LU1 Halt operation of robot</p>	7	33	40

	<p>LU2 Prepare environment for un deployment</p> <p>LU3 Uninstall robot</p> <p>LU4 Prepare components for transportation and storage (packing)</p> <p>LU5 Transport and store components</p>			
De-commission robot at workplace	<p>LU1 Prepare environment for disassembling</p> <p>LU2 Disassemble un deployed robot</p> <p>LU3 Classify reusable and repairable components</p> <p>LU4 Dispose discarded components</p>	4	36	40

Module: 0714001055 Identify security arrangements for robotics equipment

Objective of the Module: The objective of this standard is to ensure identification of security arrangements, assessment of gaps in the current security protocols and report security solutions for robotic equipment. After achieving this standard, the learner will be able to ensure security arrangements for operation of robotic equipment.

Duration:	Total hours	40	Theory:	13	Practical	27
-----------	-------------	----	---------	----	-----------	----

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Maintain Security logs	<p>The trainee must be able to:</p> <ul style="list-style-type: none"> Keep performance records timely and relevant. Acknowledge both positives and negatives of the recorded activities. Keep the logs factual and detailed. Create a sense of continuity 	<ul style="list-style-type: none"> Describe record keeping procedure. Define elements of record keeping like Time, Date, Errors, check in, check out terms. Describe logs, its types and operations. Demonstrate how to maintain logs Define positive and negative record 	<p>Total: 16 hrs. Theory: 2 hr. Practical: 14 hrs.</p>	<ul style="list-style-type: none"> Personal Computers Printer Stationary items Any Robotic Equipment with security protocol manual Log books Desk Chairs 	Class Room/ Lab

	and consistency while maintaining logs.	<ul style="list-style-type: none"> • Demonstrate how to compare event based positive and negative data record. 			
		<p>Practical: The candidate is required to prepare proper security logs highlighting significant events as per given workplace data of one week.</p>			
LU2. Follow Relevant Security Protocols	<p>The trainee must be able to:</p> <ul style="list-style-type: none"> • Identify relevant security protocols as per standard operating procedures. • Follow instructions as per 	<ul style="list-style-type: none"> • Define security protocols. • Describe limitations of security protocols. • Explain all the standard operating procedures. • Demonstrate various security 	<p>Total: 8 hrs. Theory: 2 hr. Practical: 6 hrs.</p>		Class Room/ Lab

	standard operating procedures.	protocols.			
		Practical: Get the data from record to identify the security protocols and its standard operating procedure.			
LU3. Audit Security Protocols	<ul style="list-style-type: none"> • Check whether security logs are followed as per standard operating procedures • Assess current security performance • Identify gaps in current security protocols • Formulate and report security solutions to 	<ul style="list-style-type: none"> • Explain how to check security logs. • Define security performance. • Describe various standard solution for security breach. • Describe how to evaluate performance of security protocol. • Demonstrate comprehensive audit of security protocol. 	Total: 16 hrs. Theory: 7 hr. Practical: 9 hrs.		Class Room/ Lab

	supervisor	Practical: Make a report on existing security protocols of provided workplace environment which includes procedure of checking security protocols and make a comparison with standard procedure.			
--	------------	--	--	--	--

Module: 0714001056 Operate Robots at workplace

Objective of the Module: This module relates with basic operation of robots in industry and identifies learning required for operation of robot at workplace as per standard operating procedures provided in the user manual. Trainee will be able to perform basic operation of a robot.

Durati on:	Tot al hou rs	5 0	Theo ry:	1 4	Practi cal	3 6
---------------	------------------------	--------	-------------	--------	---------------	--------

Lear ning Unit	Lear ning Outco mes	Lear ning Elem ents	Dura tion	Materi als (Tools & Equip ment) Requir ed	Lear ning Plac e
----------------------	------------------------------	------------------------------	--------------	--	---------------------------

LU1.Perform basic/initial test before operation	<p>The trainee must be able to:</p> <ul style="list-style-type: none"> • Knowledge about basic working of given component • Ensure proper connectivity of all components according to instructions • Check initial power indicators • Perform basic calibration of robot • Perform test run 	<ul style="list-style-type: none"> • Describe different robot components and their connectivity • Indicate different types of indicator • Explain initial calibrations and pre-operative test procedure • Demonstrate test run <p>Practical-1: Perform test run by ensuring components connected by looking at respective indicators</p>	Total: 15 hrs. Theory: 3 hrs. Practical: 12 hrs.	<ul style="list-style-type: none"> • Robotic Platform • Basic electronic Tool Kit 	Class Room/ Lab
LU2. Ensure Suitability of workplace for operation	<p>The trainee must be able to:</p> <ul style="list-style-type: none"> • Identify suitable work environment for the robot. • Identify obstacles that effects robot operations • Prepare suitable 	<ul style="list-style-type: none"> • Explain suitable work environment and environmental hazards • Describe robotic equipment safety • Demonstrate a suitable environment for given robot safety. 	Total: 10 hrs. Theory: 4 hr. Practical: 6 hrs.		Class Room/ Lab

	<p>work environment for the robot.</p> <ul style="list-style-type: none"> • Ensure safety for the robotic equipment. 	<p>Practical-1: Prepare suitable environments for given robot ensuring robot safety</p>			
<p>LU3. Follow standard procedures for operating the robot</p>	<p>The trainee must be able to:</p> <ul style="list-style-type: none"> • Know about operation manuals of robot • Identify the standard operating procedure for the robot. • Follow instruction as given in standard operating procedure while operating the robot • Ensure proper functioning of the robot. 	<ul style="list-style-type: none"> • Explain robots operating manual and its standard operating procedure • Demonstrate robot basic functioning according to standard operating procedure <p>Pactical-1: Identify and Perform any basic operation of a given robot as per standard operating procedure.</p>	<p>Total: 10 hrs. Theory: 4 hr. Practical: 6 hrs.</p>		<p>Class Room/Lab</p>
<p>LU4. Perform post operation test</p>	<p>The trainee must be able to:</p> <ul style="list-style-type: none"> • Recognize appropriate post operation test for the 	<ul style="list-style-type: none"> • Describe post-operative tests • Demonstrate post-operative test as per standard operating 	<p>Total: 15 hrs. Theory: 3 hrs. Practical: 12 hrs.</p>		<p>Class Room/ Lab</p>

	particular robot <ul style="list-style-type: none"> • Follow standard operating procedure to perform post operation test • Generate post operation test report 	manual. Practical-1: Perform post-operative test for given robot as per Standard operating procedure and generate test report			
--	---	--	--	--	--

General assessment guidance for Robotics Technician

Good practice in Pakistan makes, use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan, is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

Sessional assessment is going on all the time. Its purpose is to provide feedback on what students are learning:

- To the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

Final assessment is the assessment, usually on completion of a course or Level, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment of a **Robotics Technician** Level 1-4 include:

- Work performances, for example installing or Assemble Robot with required safety precautions
- Demonstrations, for example demonstrating to Assemble the Robot for specific industry.
- Direct questioning, where the assessor would ask the student why he is considering the angle and why he is applying specific functional or nonfunctional test for the given robots
- Paper-based tests, such as multiple choice or short answer questions on health & safety, Communication skill, assemble robot or perform functional test or trouble shoot the require robot etc.

Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of a **Robotics Technician** Lev-1-4 include:

- Work products, such as a Functioning robot in the specified industry or in the workplace or in the workshop.
- Completed trouble shoot report on any robotic functionality.
- Workplace documents, such as note book or practical activity journal

Indirect assessment should only be a second choice. (In some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

Principles of assessment

All assessments must meet all the following principles, regardless of the method of assessment used to evidence learners' attainment.

All assessments must produce outcomes that are:

- i. valid: the assessment evidence meets all assessment criteria and all learning outcomes
- ii. authentic: all the work is the learner's own
- iii. reliable: assessment evidence is consistent and generates outcomes that would be replicated were the assessment repeated
- iv. current: assessment evidence is up-to-date
- v. sufficient: enough work is available to justify the credit value, and to enable a consistent and reliable judgement about the learner's achievement
- vi. comparable: all assessment evidence is comparable in standard between assessments within a unit/qualification, and between learners of the same level
- vii. manageable: all assessment places reasonable demands on all learners
- viii. fair and minimize bias: assessments are fair to all learners irrespective of their characteristics (for example, age, gender, etc)

Assessment strategy for Robotics Technician Level-2 Curriculum

This curriculum consists of 13 modules:

Sessional or Developmental assessment

The sessional/developmental assessment shall be conducted after completion of each module in two parts: theoretical assessment and practical assessment.

Theoretical assessment for all learning modules must consist of a written paper lasting at least 30 minutes per module. This can be a combination of multiple choice and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final assessment

Final assessment shall also be in two parts: theoretical assessment and practical assessment.

For the final practical assessment, each student shall be assessed over a period of 4-5 hours session. During this period, each student must be assessed on his ability to perform a complete job for all Technical and functional modules.

Generic modules shall be assessed comprising with other modules at the time of final assessment. Practical work for this module could be assessed on a sessional basis.

Planning of assessment.

Planning of assessment will plan by the assessment Centre as per CBT/A policy. But for development assessment it could be plan by the Trainer during the course.

As for final assessment as concern, certified assessor must be contacted and the assessor must meet the needs of the students and the training provider. For example, where two assessors are conducting the assessment, there must be a maximum of five students per assessor. In this example, a group of 20 students shall therefore require assessments to be carried out over a four-day period. For a group of only 10 students, assessments would be carried out over a two-day period only or it could be formulated as per CBT/A Centre policies.

Complete list of tools and equipment

S. No	Description	Quantity
1	Blower	As per Requirement
2	Chisel	As per Requirement
3	Drill bits	As per

		Requirement
4	Allen key set	As per Requirement
5	Files	As per Requirement
6	Glasses (goggles)	As per Requirement
7	Gloves	As per Requirement
8	Grip plier	As per Requirement
9	Hacksaw	As per Requirement
10	Hammers	As per Requirement
11	Marking punch	As per Requirement
12	Measuring tape	As per Requirement
13	Micrometers	As per Requirement
14	Nose plier	As per Requirement
15	Open spanner set	As per Requirement
16	Phase tester	As per Requirement
17	Plier	As per Requirement
18	Ring spanner set	As per Requirement
19	Scissors	As per Requirement
20	Screw driver set	As per Requirement
21	Screw wrench	As per Requirement
22	Side cutter	As per Requirement
23	Crimping Tool	As per Requirement
24	Solder iron	As per Requirement
25	Spanner box	As per Requirement
26	Steel roll/Steel wire	As per Requirement

27	Sucker	As Requirement	per
28	Silicone Gun	As Requirement	per
29	Spirit Level	As Requirement	per
30	Electric Drill Machine	As Requirement	per
31	Hand Grinding Machine	As Requirement	per
32	Thimble plier	As Requirement	per
33	Tongs (sunny)	As Requirement	per
34	Vernier caliper	As Requirement	per
35	Wire gauge	As Requirement	per
36	Wire stripper	As Requirement	per
37	Adjustable Wrench	As Requirement	per
38	Satellite Finder	As Requirement	per
39	Multi-meter	As Requirement	per
40	Digital Compass	As Requirement	per
41	Wire Tester	As Requirement	per
42	LAN Tester	As Requirement	per
43	Rivet Gun	As Requirement	per
44	Emergency lamp	As Requirement	per
45	Coaxial Cable Stripper	As Requirement	per
46	Cable Compression Tool.	As Requirement	per
47	Air compressors.	As Requirement	per
48	Clamp meter.	As Requirement	per
49	Bench voice.	As Requirement	per
50	Drill machine.	As Requirement	per

		Requirement
51	Dryer.	As per Requirement
52	Hand grinding machine	As per Requirement

S. No.	Items
1.	Different Tags and Locks
2.	Process SOPs
3.	Equipment Maintenance Manuals
4.	Log Book
5.	Handbooks
6.	Design Books/ Sheets
7.	Pencils
8.	Erasers
9.	Pencil Sharpeners
10.	Paper Cutter
11.	Scissors
12.	Color Pencils
13.	White chart paper
14.	Brown Sheets
15.	White Board Markers (red, blue, green, black)
16.	Permanent markers (black)
17.	File covers

Credit values

The credit value of the National Certificate Level 1-4 in ROBOTICS TECHNICIAN is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following TVET guidelines).

The credit values are as follows:

Code	Name of Duty or (Module)	Category	Estimated Hours	Credit
000000000	Perform basic machining operations	Technical	50	05
000000000	Operate the electronic measuring instruments	Technical	50	05
000000000	Use measuring instruments for mechanics	Technical	50	05
000000000	Obey the workplace policies and procedures	Generic	20	02
000000000	Follow basic communication skills (general)	Generic	50	05
000000000	Operate computer functions (general)	Generic	50	05
000000000	Comply with work health and safety policies	Generic	30	03
000000000	Manage routine tasks at workplace	Functional	30	03
000000000	Maintain inventory at workplace	Functional	20	02
000000000	Identify security arrangements for robotics equipment	Technical	40	04
000000000	Operate robots at workplace	Technical	50	05
000000000	Distinguish equipment / components for assembling purpose	Technical	40	04
000000000	Do component testing for robotics	Technical	40	04
000000000	Un-deploy robot at workplace	Technical	40	04
000000000	De-commission robot at workplace	Technical	40	04
000000000	Follow professional & technical knowledge about robotics	Functional	20	02
000000000	Communicate the workplace policy and procedure	Generic	20	02
000000000	Perform basic computer application (specific)	Generic	40	04

000000000	Comply with personal health and safety guidelines	Generic	30	03
000000000	Perform basic communication (specific)	Generic	30	03
000000000	Perform functional testing of robotics	Technical	60	06
000000000	Commission robot at workplace	Technical	60	06
000000000	Deploy robot at workplace	Technical	60	06
000000000	Monitor operations of robot at workplace	Functional	40	04
000000000	Perform assembling of equipment / components	Technical	40	04
000000000	Manage logistics at workplace	Functional	40	04
000000000	Maintain product quality	Functional	20	02
000000000	Apply professional & technical knowledge about robotics	Functional	40	04
000000000	Identify and implement workplace policy and procedures	Generic	20	02
000000000	Apply work health and safety practices (WHS)	Generic	30	03
000000000	Manage personal finances	Generic	30	03
000000000	Communicate at workplace	Generic	30	03
000000000	Perform computer application skills	Generic	40	04
000000000	Supervise juniors for transfer of knowledge	Functional	30	03
000000000	Assure team productivity	Functional	30	03
000000000	Perform maintenance of robotics	Technical	50	05
000000000	Perform trouble shooting	Technical	60	06
000000000	Revise the configuration of robotics	Technical	50	05
000000000	Execute up-gradation of robotics	Technical	40	04
000000000	Develop 3D simulations	Technical	40	04
000000000	Assist engineers in design, configuration and application processes	Technical	40	04
000000000	Ensure product quality	Functional	30	03
000000000	Upgrade professional and technical knowledge about robotics	Functional	30	03
000000000	Analysis workplace policy and procedures	Generic	30	03
000000000	Contribute to work related health and safety	Generic	30	03

	(WHS) initiatives			
000000000	Perform advanced communication	Generic	30	03
000000000	Develop advance computer application skills	Generic	40	04
000000000	Manage human resource services	Generic	20	02
000000000	Develop entrepreneurial skills	Generic	30	03

