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ROBOTICS TECHNICIAN

CBT Curriculum

National Vocational Certificate Level 3

Version 1 - October, 2019

NAVTTC

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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 wells 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 (NAVTTC) 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:

1. Perform functional testing of robotics
2. Commission robot at workplace
3. Deploy robot at workplace
4. Monitor operations of robot at workplace
5. Perform assembling of equipment / components
6. Manage logistics at workplace

7. Maintain product quality
8. Apply professional & technical knowledge about robotics
9. Identify and implement workplace policy and procedures
10. Apply work health and safety practices (WHS)
11. Manage personal finances
12. Communicate at workplace
13. Perform computer application skills

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
Perform functional testing of robotics	20	40	60
Commission robot at workplace	12	48	60
Deploy robot at workplace	12	48	60
Monitor operations of robot at workplace	10	30	40
Perform assembling of equipment / components	8	32	40
Manage logistics at workplace			40
Maintain product quality			20
Apply professional & technical knowledge about robotics			40
Identify and implement workplace policy and procedures			20
Apply work health and safety practices (WHS)			30
Manage personal finances			30
Communicate at workplace			30
Perform computer application skills			40

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
Perform functional testing of robotics	20	40	60
Commission robot at workplace	12	48	60
Deploy robot at workplace	12	48	60
Monitor operations of robot at workplace	10	30	40
Perform assembling of equipment / components	8	32	40
Manage logistics at workplace			40
Maintain product quality			20
Apply professional & technical knowledge about robotics			40
Identify and implement workplace policy and procedures			20
Apply work health and safety practices (WHS)			30
Manage personal finances			30
Communicate at workplace			30
Perform computer application skills			40

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
Perform functional testing of robotics	LU1 Identify desired functionality for testing LU2 Execute relevant testing procedure LU3 Examine detailed functionality of interfaces LU4 Examine detailed functionality of equipment LU5 Generate test report	20	40	60
Commission robot at workplace	LU1 Prepare environment for commissioning of robot LU2 Unbox robotic system LU3 Comprehend commissioning and operational instructions LU4 Perform basic assembly LU5 Perform initial testing of commissioned robot	12	48	60
Deploy robot at workplace	LU1 Prepare environment for deployment of robot LU2 Transport robot and relevant system to deployment site LU3 Install robot at site LU4 Execute initial testing of deployed robot	12	48	60
Perform assembling of equipment / components	LU1 Comprehend assembly manual LU2 Prepare assembly plan LU3 Perform	8	32	40

	assembly as per SOP LU4 Verify assembly as per standards			

Module: 0714001062 Perform functional testing of robotics

Objective of the Module: This module aims to provide the required knowledge and skill to perform functional testing of robotics unit. This includes the ability to identify and execute testing procedures, as well as to examine interfaces and equipment. Upon completion of this module the learner will be able to generate comprehensive test reports.

Duration:	Total hours	60	Theory:	20	Practical	40

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Identify desired functionality for testing	The trainee must be able to: • List all functions of robotic unit • Isolate functions that require testing • Prioritize functions for testing • Organize related functions into groups • Identify and create testing procedures required to test functionality	• Describe about functional testing • Describe all the basic functionalities of robotic Unit. • Demonstrate all the basic functionalities of robotic Unit. • Describe the procedure for functional testing. • Demonstration of procedure for functional testing. • Demonstrate prioritization of function testing	**Total :12 hrs. Theory: 3 hrs. Practical:9 hrs**.	• Multi-meter • Oscilloscope • Computer systems • Professional Electronic toolkit • Professional Mechanical toolkit • RPM meter • Temperature meter • Torque meter • Barometer • Robotic system • Controller	**Class Room/Lab**

		Practical • Create and prioritize procedure required for functional testing **Practical** • Create Testing Procedure for given task • Execute testing step by step in order to perform all the functionality. • Compile Results of all the functionality testing			
LU3. Examine detailed functionality of interfaces	• List all interfaces • Identify interfaces which can be examined • Ensure firmware gave proper instruction to the hardware • Organize interface in order of examination • Identify acceptable functionality of interface • Utilize the specific interface • Examine	• Describe the functionality of interfaces • Demonstrate how to examine the interface • Describe acceptable and non-acceptable functionality of interface • Explain Firmware • Describe the functionality of firmware and related issues. • Demonstrate how to examine functioning of the specific interface • Describe the analysis	**Total :12 hrs.** **Theory: 3 hrs.** **Practical:9 hrs**.		**Class Room/Lab**

	functioning of the specific interface • Analyse examination results • Compile examination results	of results **Practice:** • Examine function of interface and analyze examination results.			
LU4. Examine detailed functionality of equipment	The trainee must be able to: • List all equipment who's functionality requires examination • List functionality of equipment's to be examined • Identify tools required for examination • Arrange tools required for	• Describe how to examine equipment and their functionality • Describe tools and arrange tools for examination • Describe acceptable and non-acceptable functionality of equipment • Demonstrate acceptable and non-acceptable functionality of equipment • Describe the analysis	**Total :12 hrs.** **Theory: 3 hrs.** **Practical:9 hrs**.		**Class Room/Lab**

	examination • Identify acceptable functionality of equipment • Examine equipment using specific tools • Analyze examination results • Compile examination results	of results • Demonstrate equipment using specific tools **Practical:** • Examine function of equipment and analyze examination results.			
LU5. Generate test report	• List all tests for which report is required • Identify result outcomes that are required to be reported • Prepare optimal template for test report • Compose test report based on template • Assure quality of test report • Identify distribution of report	• Describe Identification of result outcomes. • Describe template for test report • Describe the composition of test report based on template • Describe the quality of test report • Demonstrate how to assure quality of test report **Practical** • List all tests for reports • Prepare template for report and compose test report with quality assurance.	**Total :12 hrs.** **Theory: 3 hrs.** **Practical:9 hrs**.		**Class Room/Lab**

Module: 0714001063 Commission robot at workplace

Objective of the Module: This competency level deals with preparing environment, unboxing, commissioning and initial testing of the robotic system. The learner will be able to commission a robotic system under supervision after completing this competency level.

Duration:	Total hours	60 Hrs	Theory:	12 Hrs	Practical	48 Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Prepare environment for commissioning of robot	The trainee must be able to: • Specify environmental conditions for commissioning of robot. • Prepare suitable environment for commissioning of robot. • Arrange tools and equipment required for the commissioning of robot.	• Describe environmental requirements for commissioning of robot • Demonstrate preparation of environment for commissioning of robot • Describe tools and equipment required for commission of robot • Demonstrate arrangement of tools for commissioning of robot Practical • Given a robot from a specific robotic platform, prepare the environment and arrange tools and equipment for	**Total :12 hrs.** **Theory: 3 hrs.** **Practical:9 hrs**.	• Robotic system • Electronic tool kit • Mechanical tool kit • Computers • Printers	**Class Room/Lab**

		commissioning of robot			
LU2. Unbox robotic system	The trainee must be able to: • Identify instructions manual for unboxing of robotic system. • Arrange tools and equipment required for unboxing robotic system • Follow instructions provided in manual for unboxing of robotic system	• Describe various types of instruction manuals • Describe various tools and equipment for unboxing robotic system • Describe how to comprehend and follow instructions given in manual • Demonstrate usage of instructional manual • Demonstrate unboxing of robotic system Practical • Given a robotic system, perform proper unboxing by following given instruction manual	**Total :12 hrs.** **Theory: 3 hrs.** **Practical:9 hrs**.	As unit-1	**Class Room/Lab**
LU3. Comprehend commissioning and operational instructions	The trainee must be able to: • Identify commissioning and operational manuals. • Follow commissioning and operational instructions	• Describe various types of commissioning and operational manuals • Describe how to comprehend and follow instructions given in manuals • Demonstrate usage of instructional	**Total :12 hrs.** **Theory: 3 hrs.** **Practical:9 hrs**.	As unit-1	**Class Room/Lab**

	from manual • Assist supervisor in commissioning steps provided in manual.	manual • Demonstrate unboxing of robotic system Practical • Given a robotic system, perform proper unboxing by following given instruction manual			
LU4. Perform basic assembly	The trainee must be able to: • Identify required basic assembly • Prioritize basic assembly based on requirements • Follow instruction manual to perform basic assembly	• Describe basic assembly required for commissioning of robot • Describe procedure for determining the order of assembly • Describe how to comprehend assembly instructions from manual • Demonstrate basic assembly of robot • Practical • Given a robot that requires basic assembly, perform the said assembly as per instructions given in manual	**Total :12 hrs.** **Theory: 3 hrs.** **Practical:9 hrs**.		**Class Room/Lab**
LU5. Perform initial testing of commission	• Perform initial tests of commission	• Describe different initial tests for robot • Describe	**Total :12 hrs.** **Theory: 3 hrs.**		**Class Room/Lab**

ed robot	ed robot. • Follow steps for initial testing of robot. • Prepare initial testing report	all steps required for perform initial tests • Describe reporting formats for reporting test results • Demonstrate initial testing of robot • Demonstrate test reporting • Practical • Given a newly commissioned robot, perform initial testing as per requirements and generate a test report	**Practical:9 hrs**.		

Module: 0714001064 Deploy robot at workplace

Objective of the Module: This competency level is about preparing the deployment site along with transportation, installation and initial testing of the robotic system. The learner will be able to transport and deploy the robotic system at suitable site.

Duration:	Total hours	60 Hrs	Theory:	12 Hrs	Practical	48 Hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Prepare environment for deployment of robot	The trainee must be able to: • Specify environmental	• Describe environmental parameters required for deployment of robot • Describe	**Total: 15 hrs Theory 3 hrs. Practical 12 hrs**.	• Robotic system • Electronic tool kit • Mechanical	**Class Room/Lab**

	parameters for deployment of robot. • Identify suitable environment for deployment of robot. • Prepare suitable environment for deployment of robot.	procedure for determining suitability of environment for deployment • Demonstrate how to prepare the environment for deployment of robot Practical • Given a robot, determine the environmental parameters required for deployment and prepare the environment for deployment		tool kit • Computers • Printers • Transportation means	
LU2. Transport robot and relevant system to deployment site	The trainee must be able to: • • Identify transportation means for the robotic system. • Arrange transportation of the robot to the deployment site. • Ensure safe transportation of the robotic system.	• Describe transportation procedures for robotic system • Describe planning of transportation • Demonstrate transportation of robotic system to deployment site • Describe safety precautions required during transportation Practical • Given a robotic system, transport	**Total: 15 hrs.** **Theory: 3 hrs.** **Practical: 12 hrs**.	As unit-1	**Class Room/Lab**

		the robotic system to the deployment site safely			
CU3. Install robot at site	The trainee must be able to: • Identify installation manuals. • Arrange tools and equipment required for the deployment of robot. • Follow instructions provided in manuals to install the robot at site.	• Describe various installation manuals • Describe various tools and equipment available for deployment for robot • Describe procedure for installing the robot at deployment site • Demonstrate installation of robot at deployment site as per instructions given in manual Practical • Given a robotic system, perform installation of the robot at the deployment site as per instructions	**Total: 15 hrs.** **Theory 3 hrs.** **Practical:12 hrs**.	As unit-1	**Class Room/Lab**
LU4. Execute initial testing of deployed robot	The trainee must be able to: • Comprehend initial tests of deployed robot. • Follow steps for initial testing of deployed	• Describe initial testing of robotic system after installation • Describe how to prepare testing report • Demonstrate testing of robotic	**Total: 15 hrs.** **Theory:3 hrs.** **Practical :12 hrs**.	As unit-1	**Class Room/Lab**

	robot. • Prepare initial testing report.	system after installation Practical • Given a newly installed robotic system, perform post installation initial tests and generate test report			

Module: 0714001065 Monitor Operations of robot at workplace

Objective of the Module: This module covers the learning units required to monitor operation of robot at workplace. The trainee will be able to identify desired outcome of robot operation, identify errors, perform corrective measure, prepare operation report and maintain historic log..

Duration:	Total hours	40	Theory:	10	Practical	30

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Identify desired outcomes of robot operations	The trainee must be able to: • List all robot operation • Select robot operation for which outcomes have to be	• Explain all robot's operations and its selection for particular outcome • Outline all possible outcomes and its assessment criteria	**Total: 16 hrs.** **Theory:7 hrs.** **Practical:16 hrs**.	• Robotic system • Electronic tool kit • Mechanical tool kit • Computers • Printers • Transportation means	**Class Room/Lab**

	identified • List all possible outcomes of specified robot operation • Recognize important parameters to assess outcomes of robot operation. • Identify desired outcomes	**Practical-1:** Enlist all possible operation of robot with their possible outcomes. Practical-2 Enlist criteria for assessing an outcome of robot operation			
LU2. Examine outcomes against established threshold	The trainee must be able to: • List established thresholds for outcome • Assess outcomes of the robotic operation • Compare outcome against established thresholds	• Describe thresholds and their assessment criteria's • Demonstrate any outcome of robotic operation against established threshold. **Practial-1:** Identify any particular threshold then compare it according to the established threshold.	**Total: 16 hrs.** **Theory:7 hrs.** **Practical:9 hrs**.		**Class Room/Lab**

LU3. Identify short comings in outcomes	The trainee must be able to: • Examine errors in outcomes • Apply corrective measure to eliminate errors • Prepare operation report	• Explain different types of errors in outcome and their respective corrective measures • Demonstrate types of errors in outcome and their respective corrective measures **Practical-1:** Analyze and prepare report on the outcome of any robot operation by identifying errors and eliminating them.	**Total: 16 hrs.** **Theory:7 hrs.** **Practical:9 hrs**.		**Class Room/Lab**
LU4.Maintain historical log	The trainee must be able to: • Identify log parameter • Prepare routine log • Create sense of continuity and consistency while	• Explain the following: ○ Log parameters ○ Routine log preparation ○ continuity and consistency in logs ○ Details required in maintaining log	**Total: 16 hrs.** **Theory:7 hrs.** **Practical:9 hrs**.		**Class Room/Lab**

	maintaining logs • Keep the log factual and detailed	• Demonstrate report on existing Historical log which includes identification of log parameter etc. **Practical-1:** Prepare routine log report, add all required parameters and information. Make sure logs have sense of continuity, consistency and contain factual details.			

Module: 0714001066 Perform assembling of equipment / components

Objective of the Module: The objective of this exercise is to make a functional robot by performing assembly of equipment/ components. The trainee will be able to understand the robot architecture and will be able to assemble various types of robots.

Duration:	Total hours	40 Hrs	Theory:	8	Practical	32

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials (Tools & Equipment) Required	Learning Place
LU1. Comprehend assembly manual	The trainee must be able to: • Acquire list of assembly manuals • Select relevant assembly/ installation manuals • Read instruction manual thoroughly • Mark relevant steps for assembly	• Define assembly manuals. • Explain purpose of assembly manuals. • Describe how we can choose correct assembly manuals. • Explain how to collect all assembly manuals for assembling a Robot. **Practical:** Select any model of Robot which is available and collect all of its assembling manuals and then write the relevant steps for assembly in your	**Total: 10 hrs.** **Theory:2 hrs.** **Practical:8 hrs**	• Mechanical tools kit • Electrical tool kit • Robotic tool kit	**Class Room/Lab**

		report.			
LU2. Prepare assembly plan	The trainee must be able to: • List the operation procedure for assembly • Organize the assembly plan • Make list of required items • Identify necessary tools required for assembly • Devise an alternate plan if necessary	• Describe each operational procedure for assembly. • Explain how to organize any plan for assembly. • Explain the purpose of each tool used in assemble a Robot. **Practical:** Make a list of operational procedures for assemble a robot and collect all tools required for assembling.	**Total: 10 hrs.** **Theory:2 hrs.** **Practical:8 hrs**	As Unit-1	**Class Room/Lab**
LU3. Perform assembly as per SOP	The trainee must be able to: • Ensure safety standards • Prepare a working environment for assembly • List all steps	• Define health and safety standards. • Use proper working gear during working. • Describe working environ	**Total: 10 hrs.** **Theory:2 hrs.** **Practical:8 hrs**		**Class Room/Lab**

	as per SOP. • Prioritize the assembly steps • Follow the assembly steps.	ment. • Ensure use of proper lifting machinery for Robot handling. • Define all SOP for assembling. • Define all assembly steps. **Practical:** Make a report with pictures which shows all the steps of assembling a robot with safety measures.			
LU4. Verify assembly as per standards	The trainee must be able to: • List all assemblies performed • Select assemblies that require verification • Identify verification procedure for selected assembly	• Elaborate verification procedure. • Describe the assembly which needs to be verified. • Explain the drawing of each assembly. • Describe procedure to	**Total: 10 hrs.** **Theory:2 hrs.** **Practical:8 hrs**	As unit-1	**Class Room/Lab**

	• Match the assembly with the drawing • Inspect joint/links coupling of the robot • Verify the wire connections • Compare assembly with the manual • Generate verification report	inspect the joints coupling. • Describe all power up connections. **Practical**: Assemble the complete robot and make a report with pictures to elaborate all wiring connections, procedure of assembly verification and inspection of joint coupling.			

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** Lev-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 Lev-1-4 Curriculum

This curriculum consists of 49 modules:

Module-1	Perform basic machining operations
Module-2	Operate the electronic measuring instruments
Module-3	Use measuring instruments for mechanics
Module-4	Obey the workplace policies and procedures
Module-5	Follow basic communication skills (general)
Module-6	Operate computer functions (general)
Module-7	Comply with work health and safety policies
Module-8	Manage routine tasks at workplace
Module-9	Maintain inventory at workplace
Module-10	Identify security arrangements for robotics equipment
Module-11	Operate robots at workplace
Module-12	Distinguish equipment / components for assembling purpose
Module-13	Do component testing for robotics
Module-14	Un-deploy robot at workplace
Module-15	De-commission robot at workplace
Module-16	Follow professional & technical knowledge about robotics
Module-17	Communicate the workplace policy and procedure
Module-18	Perform basic computer application (specific)
Module-19	Comply with personal health and safety guidelines
Module-20	Perform basic communication (specific)

Module-21	Perform functional testing of robotics
Module-22	Commission robot at workplace
Module-23	Deploy robot at workplace
Module-24	Monitor operations of robot at workplace
Module-25	Perform assembling of equipment / components
Module-26	Manage logistics at workplace
Module-27	Maintain product quality
Module-28	Apply professional & technical knowledge about robotics
Module-29	Identify and implement workplace policy and procedures
Module-30	Apply work health and safety practices (WHS)
Module-31	Manage personal finances
Module-32	Communicate at workplace
Module-33	Perform computer application skills
Module-34	Supervise juniors for transfer of knowledge
Module-35	Assure team productivity
Module-36	Perform maintenance of robotics
Module-37	Perform trouble shooting
Module-38	Revise the configuration of robotics
Module-39	Execute up-gradation of robotics
Module-40	Develop 3D simulations
Module-41	Assist engineers in design, configuration and application processes
Module-42	Ensure product quality

Module-43	Upgrade professional and technical knowledge about robotics
Module-44	Analysis workplace policy and procedures
Module-45	Contribute to work related health and safety (WHS) initiatives
Module-46	Perform advanced communication
Module-47	Develop advance computer application skills
Module-48	Manage human resource services
Module-49	Develop entrepreneurial skills

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.

Plaining 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	Ellen 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 per Requirement
28	Silicone Gun	As per Requirement
29	Spirit Level	As per Requirement
30	Electric Drill Machine	As per Requirement
31	Hand Grinding Machine	As per Requirement
32	Thimble plier	As per Requirement
33	Tongs (sunny)	As per Requirement
34	Vernier caliper	As per Requirement
35	Wire gauge	As per Requirement
36	Wire stripper	As per Requirement
37	Adjustable Wrench	As per Requirement
38	Satellite Finder	As per Requirement
39	Multi-meter	As per Requirement
40	Digital Compass	As per Requirement
41	Wire Tester	As per Requirement
42	LAN Tester	As per Requirement
43	Rivet Gun	As per Requirement
44	Emergency lamp	As per Requirement

45	Coaxial Cable Stripper	As per Requirement
46	Cable Compression Tool.	As per Requirement
47	Air compressors.	As per Requirement
48	Clamp meter.	As per Requirement
49	Bench voice.	As per Requirement
50	Drill machine.	As 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

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