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ROBOTICS TECHNICIAN



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TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019



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Introduction

Competence-based training helps to bridge the gap between what is taught in training and what tasks will be performed on the job. Training trainees to perform actual job functions helps to ensure that future front-line workers have the skills, knowledge and abilities required to perform their jobs properly, safely and effectively. In addition to competence-based training, assessment based on the performance of actual work competencies helps to ensure that:

- trainees are performing their work tasks as safely as possible
- performance gaps are recognized prior to serious incidents
- training can be implemented to improve competence.

There are significant benefits to competence-based training:

1. Cost effectiveness

Since training activities and assessments in a competence-based approach are goal-oriented, trainers focus on clearly defined areas of skills, knowledge and understanding that their own industry has defined in the competence standards. At the same time, trainees are more motivated to learn when they realize the benefits of improved performance.

2. Efficiency

The transfer gap between the training environment and working on the job is reduced substantially in a competence-based approach. This is because training and assessment are relevant to what needs to be done on the job. As a result, it takes less time for trainees to become competent in the required areas. This, in turn, contributes to improved efficiency where training and assessment are concerned.

3. Increased productivity

When trainees become competent in the competence standards that their own industry has defined, when they know what the performance expectations are and receive recognition for their abilities through successful assessments, they are likely to be more motivated and experience higher job satisfaction. The result is improved productivity for organizations. The communication and constructive feedback between future employers and employees will improve as a result of a competence-based approach, which can also increase productivity.

4. Reduced risk

Using a competence-based approach to training, development, and assessment, employers are able to create project teams of people with complementary skills. A trainee's record of the skills, knowledge and understanding relating to the competence standards they have achieved can be used by a future employer to identify and provide further relevant training and assessment for new skills areas. Competence standards can shape employee development and promotional paths within an organization and give employees the opportunity to learn more competencies beyond their roles. It can also provide organizations with greater ability to scale and flex as needed, thereby reducing the risk they face.

5. Increased customer satisfaction

Employees who have been trained and assessed using a competence-based approach are, by the definition of the relevant competence standards, able to perform the required tasks associated with a job. The knock-on effect is that, in service-related industries, they are able to provide high service levels, thereby increasing customer satisfaction. In production or manufacturing industries, they are able to work closely to industry standards in a more effective and efficient way.

Lesson plans

This manual provides a series of lesson plans that will guide delivery of each module for the *ROBOTICS TECHNICIAN (Level 1 -4)* qualification. It is important for trainers to be flexible and be ready to adapt lesson plans to suit the context of the subject and the needs of their trainees.

Good teachers acknowledge that CBT means each and every trainee in the class learns at a different speed. The good teacher is prepared to throw aside the day's lesson plan and do something different (and unplanned) for the class even if it means 'writing' a lesson plan for each trainee to match their learning pace for that day or week.

Learning by doing is different from learning theory and then applying it. To learn to do something, trainees need someone looking over their shoulder saying 'it's not quite like that, it's like this', 'you do it like this because ...', or even 'tell me why you chose to do it like this?'.

In this way, trainees learn that theoretical knowledge is meaningless if it is not seen in the context of what they are doing. In other words, if a trainee doesn't know why they do something, they will not do it competently (skills underpinned by knowledge = competent performer).

This is how a *ROBOTICS TECHNICIAN (Level 1 -4)* acquires a practical grasp of the standards expected. It's not by learning it in theory, but because those standards are acquired through correction by people who show what the standards are, and correct the trainee where they do not meet those standards, and where they repeat it correction until they have internalised those standards.

Demonstration of skill

Demonstration or modeling a skill is a powerful tool, which is used, in vocational training. The instructions for trainers for demonstration are as under:

- a) Read the procedure mentioned in the Trainer Guide for the relevant Learning Unit before demonstration.
- b) Arrange all tools, equipment and consumable material, which are required for demonstration of a skill.
- c) Practice the skill before demonstration to trainees, if possible.
- d) Introduce the skill to trainees clearly at the commencement of demonstration.
- e) Explain how the skill relates to the skill(s) already acquired and describe the expected results or show the objects to trainees.
- f) Carry out demonstration in a way that can be seen by all trainees.
- g) Use the same tools and materials that the learner will be using.
- h) Go through EACH of the steps involved in performing the skill.
- i) Go SLOWLY - describe each step as it is completed.

- j) Encourage the learners to move around and watch what you are doing from a number of different angles.
- k) Identify critical or complex steps, or steps that involve safety precautions to be followed.
- l) Explain theoretical knowledge where applicable and ask questions to trainees to test their understanding.
- m) Try to involve the learners: Ask them questions about why they think the process may work that way.
- n) Repeat critical steps in demonstration, if required.
- o) Summarize the demonstration by asking questions to trainees.

Involvement in the process (actively seeing) is important at this stage. When you work on getting involved, getting people to participate, you make them a part of what is happening. Questions for clarification or explanation are important throughout the demonstration. It is up to the learners to ask questions about things they do not understand, but it is also important for trainers to seek out and elicit questions from learners. A trainer may need to do repeated demonstrations of difficult or complex skills.

Overview of the program

Course: <i>ROBOTICS TECHNICIAN (Level 1 – 4)</i>	Total Course Duration: 3200 hrs
Course Overview:	
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.	

Module	Learning Unit	Duration
Module 1: Perform basic machining operations Aim: This competency standard is designed to gain basic knowledge and skills required to read and interpret assembly drawings, perform bench work operations using different tools and equipment, perform lathe machine operations and prepare materials for a welding job in accordance with the organization's approved guidelines and procedures.	LU1: Interpret Assembly Drawings LU2: Perform Bench Work on Metallic Surfaces LU3: Prepare Bench work surface LU4: Prepare Materials for Welding	50 hrs
Module 2: Operate the Electronic Measuring Instruments Aim: The purpose of this	LU1: Evaluate the measuring instrument LU2: Operate Electrical Analog measuring instruments LU3: Operate digital measuring instruments	50 hrs

Module	Learning Unit	Duration
competency standard is to become familiar with different types of electrical and electronic measuring instruments. After completion of this competency standard the candidate will be skilled in taking measurement from different types of electrical and electronic measuring instruments.	LU4: Familiarize with basics of oscilloscope and function generator	
Module3: Use measuring instruments for mechanics Aim: This competency standard covers the skills and knowledge required to take measurements with Steel rule, Hook rule, Folding rule, Trammels, combination set, micrometer, Vernier caliper, various gauges and different measurement instruments.	LU1: Take measurements with graduated tools LU2: Take measurements with combination set LU3: Take measurements through various gauges LU4: Perform measurements through Micrometer LU5: Measure dimensions with Vernier tools LU6: Perform different measurements	50 hrs
Module4: Identify Security Arrangements for Robotics Equipment Aim: The objective of this standard is to ensure identification of security arrangements, assessment of gaps in the current security protocols and report security	LU1: Maintain Security logs LU2: Follow Relevant Security Protocols LU3: Audit Security Protocols	40 hrs

Module	Learning Unit	Duration
solutions for robotic equipment. After achieving this standard, the learner will be able to ensure security arrangements for operation of robotic equipment		
Module 5: Operate Robots at workplace Aim: This Competency Standard relates with basic operation of robots in industry and identifies competencies 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.	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	50 hrs
Module6: Distinguish equipment/components for assembling purpose Aim: Robot parts include a wide variety of components related to: Manipulator, End-effector, Locomotion Device, Controller, Sensors. This competency aims at distinguishing different tools and components involved in assembly of a robot at workplace and also involves prior preparation.	LU1: Identify different components for 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	40 hrs

Module	Learning Unit	Duration
Module 7: Do component testing for robotics Aim: This competency standard deals with preparation of testing work bench, execute component testing for robotics and checking calibration status of the work bench. The learner will be able to perform component testing using the work bench and prepare a calibration report of test work bench after completing this competency level.	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	40 hrs
Module 8: Undeploy robot at workplace Aim: This Competency Standard is developed to train how to halt operation and uninstall robot at workplace for undeployment. After completing this standard, the trainee will be able to halt the operation, uninstall and undeploy the robot at workplace and efficiently transport it to the proper storage place	LU1: Halt operation of robot LU2: Prepare environment for undeployment LU3: Uninstall robot LU4: Prepare components for transportation and storage (packing) LU5: Transport and store components	40 hrs
Module 9: De-commission robot at workplace Aim: This Competency Standard identifies the competencies, for	LU1: Prepare environment for disassembling LU2: Disassemble undeployed robot LU3: Classify reusable and repairable components LU4: Dispose discarded components	40 hrs

Module	Learning Unit	Duration
decommissioning and/or removal of equipment, is to ensure all equipment decommissioning/ removal and support systems decommissioning/removal are executed in a manner consistent with applicable codes, regulations and sound engineering practices. After passing this competency student will be able to ensure that equipment and support systems are decommissioned and removed in a manner that will allow lowest possible risk to employees, the facility, operations or maintenance activities.		
Module 10: Follow Professional & technical knowledge about robotics Aim: Robot technicians should be well-versed in theoretical approaches to robotics, as well as laboratory methodologies and standards. Robot technicians should understand the anatomy of an industrial robot and be familiar with its manufacturing	LU1: Participate in on job training LU2: Seek Mentorship LU3: Participate in skills assessment	20 hrs

Module	Learning Unit	Duration
process in order to determine the best solutions to technical issues and enhancement needs. Solid interpersonal skills and creativity are also invaluable		
Module 11: Perform Functional testing of robotics Aim: 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.	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	60 hrs
Module 12: Commission robot at workplace Aim: 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.	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	60 hrs
Module 13: Deploy robot at workplace	LU1: Prepare environment for deployment of robot	60 hrs

Module	Learning Unit	Duration
Aim: 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.	LU2: Transport robot and relevant system to deployment site LU3: Install robot at site LU4: Execute initial testing of deployed robot	
Module 14: Apply professional & technical knowledge about robotics Aim: This competency level aims to provide knowledge and skills to identify and improve the skill set. It also helps the learner to understand the skill assessment procedures and mentor his co-workers. The learner will be able to apply professional and technical knowledge in improving the skill sets and assessments.	LU1: Identify areas for further improvement LU2: Improve the selected skills set LU3: Provide mentorship for co-workers LU4: Participate in skill assessment	40 hrs
Module 15: Monitor Operations of robot at workplace Aim: This Competency Standard covers the competencies required to monitor operation of robot at workplace. The trainee will be able to identify desired	LU1: Identify desired outcomes of robot operations LU2: Examine outcomes against established thresh hold LU3: Identify short comings in outcomes LU4: Maintain historical log	40 hrs

Module	Learning Unit	Duration
outcome of robot operation, identify errors, perform corrective measure, prepare operation report and maintain historic log.		
Module 16: Perform assembling of equipment / components. Aim: 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.	LU1: Comprehend assembly manual LU2: Prepare assembly plan LU3: Perform assembly as per SOP LU4: Verify assembly as per standards	40 hrs
Module 17: Perform maintenance of robotics Aim: This Competency Standard identifies the required skills and knowledge to adopt for maintenance of robotic systems. After completing this competency trainee will be able to develop maintenance schedule, perform maintenance,	LU1: Develop maintenance schedule LU2: Perform maintenance as per procedure standards and guidelines LU3: Supervise maintenance staff LU4: Ensure timely maintenance to avoid negative outcomes LU5: Perform component / functionality test after maintenance LU6: Generate maintenance report	50 hrs

Module	Learning Unit	Duration
supervise and ensure maintenance as per standard procedures. Trainee will also be able to perform post maintenance test to ensure proper working.		
Module 18: Perform trouble shooting Aim: This competency standard deals with identification and rectification of the problem occurred in the robotic system. The learner will be able to identify and resolve the problem according to the troubleshooting manual. It also helps the learner to prepare a comprehensive diagnostic report of the troubleshooting.	LU1: Identify the problem LU2: Gather more details related to problem LU3: Identify possible solutions LU4: Attempt a fix based on findings LU5: Generate diagnostic report	60 hrs
Module 19: Revise the configuration of robotic system Aim: This Competency Standard covers the required skills and knowledge for revising configuration of the robotic system according to the need of specified task. The trainee will be able to learn how to identify and reconfigure software and	LU1: Verify detailed functionality of equipment LU2: Verify detailed functionality of interface LU3: Identify task that require re-configuration of equipment LU4: Ensure integration of reconfigured equipment LU5: Upgrade software modules LU6: Ensure testing and smooth functionality of equipment	50 hrs

Module	Learning Unit	Duration
hardware modules of the robotic system as per desired task.		
Module 20: Execute up-gradation of robotic system Aim: This Competency Standard covers the required skills and knowledge for execution of up-gradation of robotic equipment. The trainee will be able to learn about identification process of equipment up-gradation, installation of software, hardware components and post operating tests.	LU1: Identify current state of equipment for up- gradation LU2: Recommend up-gradation of specific equipment LU3: Install / replace software modules LU4: Install / replace physical components LU5: Perform post up-gradation test: LU6: Ensure expected outcomes	40 hrs
Module 19: Develop 3D simulations Aim The objective of this exercise is to have the knowledge and understanding of 3D simulations. This includes managing 3D modeling tools, building and simulating 3D models, generating coordinating systems for 3D models, and testing generated G-Codes.:	LU1: Manage 3D modeling tools LU2: Build models in 3D environment LU3: Simulate 3D models LU4: Convert / generate coordinating system for 3D model LU5: Test generated G-Code	40 hrs
Module 20: Assist engineers in design, configuration and application processes Aim: This competency standard	LU1: Execute repetitive/ manual design process LU2: Manage tools and equipment LU3: Execute test plan	40 hrs

Module	Learning Unit	Duration
explains how to assist engineers in executing the design process, managing tools/equipment and perform tests according to given plan. The learner will be able to understand the design process, management of tools and equipment and performing tests according to manuals after completing this competency.		

FORMAT FOR LESSON PLAN			
Module A: Perform basic machining operations			
Learning Unit> CU1. Interpret Assembly Drawings			
Learning Outcomes> • Recognize basics of lines used in engineering drawings • Understand different types of lines in engineering drawings • Understand types of drawing views • Identify assembly requirements according to drawings • Understand job layout according to assembly requirement			
Methods Demonstration, Lesson	Key Notes Tools, materials and equipment used for Interpret Assembly Drawings	Media White board Multi media	Time 30 min
Introduction			
Demonstration, Lesson	This session will introduce learners to the tools, techniques and material used for Interpret Assembly Drawings , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
Demonstration, Lesson	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Recognize basics of lines used in engineering drawings • Understand different types of lines in engineering drawings • Understand types of drawing views • Identify assembly requirements according to drawings • Understand job layout according to assembly requirement		10 hrs

Conclusion		
- Summarize the lesson by reviewing important facts. - Also conclude the session, review the tools, techniques and material used for Interpret Assembly. Give learners the opportunity to ask questions.		1 hrs
<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hrs
Total time:		13 hrs.

FORMAT FOR LESSON PLAN				
Module: Operate the Electronic Measuring Instruments				
Learning Unit> CU1. Evaluate the measuring instrument				
Learning Outcomes> - Classify the instrument type (analog/digital). - Check the type of power source needed. - Evaluate and assemble the device and probes with proper procedure (as per manual). - Perform zero error test as described in the procedure. - Identify the measuring units/parameters of the device as per SOP. - Set the readability of the instrument with respect to range. - Record the findings and develop the report.				
Methods Demonstration, Lesson, Illustration	Key Notes Tools, materials and equipment used for Evaluate the measuring instrument		Media White board, Multimedia Projector	Time 1 Hrs
Introduction				
Demonstration, Lesson	This session will introduce learners to the tools, techniques and material used for Evaluate the measuring instrument , using presentation, demonstration, question and answer, and practical skills development.			2 hrs
Main Body				
Demonstration, Lesson	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: Classify the instrument type (analog/digital). Check the type of power source needed.			13 hrs

	• Evaluate and assemble the device and probes with proper procedure (as per manual). • Perform zero error test as described in the procedure. • Identify the measuring units/parameters of the device as per SOP. • Set the readability of the instrument with respect to range. • Record the findings and develop the report.		
Conclusion			
	• Summarize the lesson by reviewing important facts. • Also conclude the session, review the tools, techniques and material used for Evaluate the measuring instrument. Give learners the opportunity to ask questions.		1 hr
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		3 hrs
Total time:			20 hrs

FORMAT FOR LESSON PLAN			
Module: Use measuring instruments for mechanics			
Learning Unit> CU1. Take measurements with graduated tools			
Learning Outcomes> • Take measurements using a Steel rule • Take measurements using a Hook rule • Take measurements using a Folding rule • Take measurements with Trammels			
Methods	Key Notes		Media
Demonstration,	Tools, materials and equipment used for Take measurements with graduated tools		White
			15 min

Lesson		board Multi media	
Introduction			
Demonstration, Lesson	This session will introduce learners to the tools, techniques and material used for Take measurements with graduated tools , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
Demonstration, Lesson, Illustrative talk	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Take measurements using a Steel rule • Take measurements using a Hook rule • Take measurements using a Folding rule • Take measurements with Trammels		5 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. • Also conclude the session, review the tools, techniques and material used for Take measurements with graduated tools. Give learners the opportunity to ask questions.		15 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			7 hrs.

FORMAT FOR LESSON PLAN

Module: Identify Security Arrangements for Robotics Equipment			
Learning Unit> Maintain Security logs			
Learning Outcomes> • 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 and consistency while maintaining logs.			
Methods Demonstration, Lesson	Key Notes Tools, materials and equipment used for Maintain Security logs	Media White board Multi media	Time 30 min
Introduction			
Demonstration, Lesson	This session will introduce learners to the tools, techniques and material used for Maintain Security logs , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
Demonstration, Lesson, Illustrative talk	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • 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 and consistency while maintaining logs.		13 hrs.
Conclusion			
	• Summarize the lesson by reviewing important facts. • Also conclude the session, review the tools, techniques and material used for Maintain Security logs. Give learners the opportunity to ask questions.		30 min

	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1.5 hrs.
Total time:			16 hrs.

FORMAT FOR LESSON PLAN				
Module: Operate Robots at workplace				
Learning Unit> CU1. Perform basic/initial test before operation				
Learning Outcomes> - 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				
Methods Demonstration, Lesson, Illustration	Key Notes Tools, materials and equipment used for Perform basic/initial test before operation		Media White board, Multimedia Projector	Time 30 min
Introduction				
	This session will introduce learners to the tools, techniques and material used for Perform basic/initial test before operation , using presentation, demonstration, question and answer, and practical skills development.			1 hr
Main Body				

	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • 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		12 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. • Also conclude the session, review the tools, techniques and material used for Perform basic/initial test before operation. Give learners the opportunity to ask questions.		30 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			15 hrs.

FORMAT FOR LESSON PLAN			
Module: Distinguish equipment/components for assembling purpose			
Learning Unit> CU1. Identify different components for assembly			
Learning Outcomes> • List all assembly components • Distinguish between different types of components based on various traits. • Label components			
Methods Demonstration, Lesson, Illustration	Key Notes Tools, materials and equipment used for Identify different components for assembly	Media White board, Multimedia Projector	Time 15 min

Introduction			
	This session will introduce learners to the tools, techniques and material used for Identify different components for assembly , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • List all assembly components • Distinguish between different types of components based on various traits. • Label components		8 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. • Also conclude the session, review the tools, techniques and material used for Identify different components for assembly. Give learners the opportunity to ask questions.		15 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10

FORMAT FOR LESSON PLAN	
Module>	Do component testing for robotics
Learning Unit>	CU1. Prepare testing work bench
Learning Outcomes>	• Identify work bench components

• Identify testing criteria according to given standard • Follow instructions to prepare test bench			
Methods Demonstration, Lesson, Illustration	Key Notes Tools, materials and equipment used for Prepare testing work bench	Media White board, Multimedia Projector	Time 15 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Prepare testing work bench , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
Demonstration, Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Identify work bench components • Identify testing criteria according to given standard • Follow instructions to prepare test bench		6 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. • Also conclude the session, review the tools, techniques and material used for Prepare testing work bench Give learners the opportunity to ask questions.		15 min
	Assessment Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			8 hrs

FORMAT FOR LESSON PLAN

Module> Undeploy robot at workplace				
Learning Unit> CU1.: Halt operation of robot				
Learning Outcomes> • Identify procedure for shutting down of robot. • Follow steps provided in standard operating manual. • Ensure safety standards during the procedure.				
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Halt operation of robot		Media White board, Multimedia Projector	Time 15 min
Introduction				
	This session will introduce learners to the tools, techniques and material used for Halt operation of robot , using presentation, demonstration, question and answer, and practical skills development.			30 min
Main Body				
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Identify procedure for shutting down of robot. • Follow steps provided in standard operating manual. • Ensure safety standards during the procedure.			5 hrs
Conclusion				
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Halt operation of robot , Give learners the opportunity to ask questions.			15 min

	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			7 hrs

FORMAT FOR LESSON PLAN				
Module> De-commission robot at workplace				
Learning Unit> CU1.: Prepare environment for disassembling				
Learning Outcomes> • Identify disassembling requirements • Perform pre-decommissioning checks such as Environment, health and safety (EHS). • Select appropriate tools for disassembling of robot.				
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Prepare environment for disassembling		Media White board, Multimedia Projector	Time 15 min
Introduction				
	This session will introduce learners to the tools, techniques and material used for Prepare environment for disassembling , using presentation, demonstration, question and answer, and practical skills development.			30 min
Main Body				
Demonstration , Lesson,	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Identify disassembling requirements			8 hrs.

Illustration	• Perform pre-decommissioning checks such as Environment, health and safety (EHS). • Select appropriate tools for disassembling of robot.		
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Prepare environment for disassembling. Give learners the opportunity to ask questions.		15 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10 hrs

FORMAT FOR LESSON PLAN				
Module> Perform functional testing of robotics				
Learning Unit> CU1: Identify desired functionality for testing				
Learning Outcomes> • 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				
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Identify desired functionality for testing		Media White board, Multimedia Projector	Time 15 min
Introduction				

	This session will introduce learners to the tools, techniques and material used for Identify desired functionality for testing , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • 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		10 hrs.
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Identify desired functionality for testing . Give learners the opportunity to ask questions.		15 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			12 hrs

FORMAT FOR LESSON PLAN	
Module>	Commission robot at workplace
Learning Unit>	CU1: Prepare environment for commissioning of robot
Learning Outcomes>	• Specify environmental conditions for commissioning of robot. • Prepare suitable environment for commissioning of robot. • Arrange tools and equipment required for the commissioning of robot.

Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Prepare environment for commissioning of robot	Media White board, Multimedia Projector	Time 15 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Prepare environment for commissioning of robot , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Specify environmental conditions for commissioning of robot. • Prepare suitable environment for commissioning of robot. • Arrange tools and equipment required for the commissioning of robot.		10 hrs.
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Prepare environment for commissioning of robot . Give learners the opportunity to ask questions.		15 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			12 hrs

FORMAT FOR LESSON PLAN

Module> Deploy robot at workplace			
Learning Unit> CU1: Prepare environment for deployment of robot			
Learning Outcomes> • Specify environmental parameters for deployment of robot. • Identify suitable environment for deployment of robot. • Prepare suitable environment for deployment of robot.			
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Prepare environment for commissioning of robot	Media White board, Multimedia Projector	Time 30 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Prepare environment for commissioning of robot , using presentation, demonstration, question and answer, and practical skills development.		30 min
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Specify environmental parameters for deployment of robot. • Identify suitable environment for deployment of robot. • Prepare suitable environment for deployment of robot.		11 hrs, 30 min
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Prepare environment for commissioning of robot . Give learners the opportunity to ask questions.		30 min

	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		2 hr.
Total time:			15 hrs

FORMAT FOR LESSON PLAN				
Module> Monitor Operations of robot at workplace				
Learning Unit> CU1: Identify desired outcomes of robot operations				
Learning Outcomes> • List all robot operation • Select robot operation for which outcomes have to be identified • List all possible outcomes of specified robot operation • Recognize important parameters to assess outcomes of robot operation. • Identify desired outcomes				
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Identify desired outcomes of robot operations		Media White board, Multimedia Projector	Time 30 min
Introduction				
	This session will introduce learners to the tools, techniques and material used for Identify desired outcomes of robot operations , using presentation, demonstration, question and answer, and practical skills development.			1 hr.
Main Body				
Demonstration , Lesson,	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives:			12 hrs

Illustration	• List all robot operation • Select robot operation for which outcomes have to be identified • List all possible outcomes of specified robot operation • Recognize important parameters to assess outcomes of robot operation. • Identify desired outcomes		
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Identify desired outcomes of robot operations. Give learners the opportunity to ask questions.		30 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		2 hr.
Total time:			16 hrs

FORMAT FOR LESSON PLAN			
Module> Perform assembling of equipment / components			
Learning Unit> CU1: Comprehend assembly manual			
Learning Outcomes> • Acquire list of assembly manuals • Select relevant assembly/ installation manuals • Read instruction manual thoroughly • Mark relevant steps for assembly			
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Comprehend assembly manual	Media White board, Multimedia Projector	Time 30 min
Introduction			

	This session will introduce learners to the tools, techniques and material used for Comprehend assembly manual , using presentation, demonstration, question and answer, and practical skills development.		1 hr.
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Acquire list of assembly manuals • Select relevant assembly/ installation manuals • Read instruction manual thoroughly • Mark relevant steps for assembly		7 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Comprehend assembly manual . Give learners the opportunity to ask questions.		30 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10 hrs

FORMAT FOR LESSON PLAN	
Module>	Perform maintenance of robotics
Learning Unit>	CU1: Develop maintenance schedule
Learning Outcomes>	• Identify equipment that require maintenance • Determine frequency of maintenance required • Prioritize required maintenance • Create database on equipment to be inspected and maintained

Draft maintenance plan			
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Develop maintenance schedule	Media White board, Multimedia Projector	Time 30 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Develop maintenance schedule , using presentation, demonstration, question and answer, and practical skills development.		1 hr.
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: - Identify equipment that require maintenance - Determine frequency of maintenance required - Prioritize required maintenance - Create database on equipment to be inspected and maintained - Draft maintenance plan		7 hrs
Conclusion			
	Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Develop maintenance schedule . Give learners the opportunity to ask questions.		30 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10 hrs

FORMAT FOR LESSON PLAN			
Module> Perform trouble shooting			
Learning Unit> CU1: Identify the problem			
Learning Outcomes> • Examine the robotic system. • Enlist the identified problems. • Classify the problems.			
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Identify the problem	Media White board, Multimedia Projector	Time 30 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Identify the problem , using presentation, demonstration, question and answer, and practical skills development.		1 hr.
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Examine the robotic system. • Enlist the identified problems. • Classify the problems.		6 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Identify the problem . Give learners the opportunity to ask questions.		30 min

	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10 hrs

FORMAT FOR LESSON PLAN			
Module> Revise the configuration of robotics			
Learning Unit> CU1: Verify detailed functionality of equipment			
Learning Outcomes> • Identify functionality tests for checking robot • Perform functionality test for robot • Ensure proper functionality of the equipment			
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Verify detailed functionality of equipment	Media White board, Multimedia Projector	Time 15 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Verify detailed functionality of equipment , using presentation, demonstration, question and answer, and practical skills development.		30 min.
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Identify functionality tests for checking robot • Perform functionality test for robot		5 hrs

	• Ensure proper functionality of the equipment		
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Verify detailed functionality of equipment. Give learners the opportunity to ask questions.		15 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			7 hrs

FORMAT FOR LESSON PLAN			
Module> Execute up-gradation of robotics			
Learning Unit> CU1: Identify current state of equipment for up- gradation			
Learning Outcomes> • Identify reason for up-gradation of equipment • Identify tasks and related component that need up-gradation • Ensure need to upgrade equipment			
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Identify current state of equipment for up-gradation	Media White board, Multimedia Projector	Time 30 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Identify current state of equipment for up- gradation , using presentation, demonstration, question and answer, and practical skills development.		1 hr.

Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Identify reason for up-gradation of equipment • Identify tasks and related component that need up-gradation • Ensure need to upgrade equipment		6 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Identify current state of equipment for up- gradation . Give learners the opportunity to ask questions.		30 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10 hrs

FORMAT FOR LESSON PLAN			
Module> Develop 3D simulations			
Learning Unit> CU2: Build models in 3D environment			
Learning Outcomes> • List the available simulation modes. • Select the required simulation mode. • Interpret the given design specifications • Formulate the procedure to design the model • Design the model according to specifications • Cross-check design specifications with the built model			
Methods Demonstration ,	Key Notes Tools, materials and equipment used for Build models in 3D environment	Media White board, Multimedia	Time 30 min

Lesson, Illustration		Projector	
Introduction			
	This session will introduce learners to the tools, techniques and material used for Build models in 3D environment , using presentation, demonstration, question and answer, and practical skills development.		1 hr.
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • List the available simulation modes. • Select the required simulation mode. • Interpret the given design specifications • Formulate the procedure to design the model • Design the model according to specifications • Cross-check design specifications with the built model		6 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Build models in 3D environment . Give learners the opportunity to ask questions.		30 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10 hrs

FORMAT FOR LESSON PLAN	
Module>	Assist engineers in design, configuration and application
Learning Unit>	CU1: Execute repetitive/ manual design process

Learning Outcomes> • Collect the design process instruction from an Engineer. • Follow the instructions to execute the design process. • Report problems occurred during the design process.			
Methods Demonstration , Lesson, Illustration	Key Notes Tools, materials and equipment used for Execute repetitive/ manual design process	Media White board, Multimedia Projector	Time 30 min
Introduction			
	This session will introduce learners to the tools, techniques and material used for Execute repetitive/ manual design process , using presentation, demonstration, question and answer, and practical skills development.		1 hr.
Main Body			
Demonstration , Lesson, Illustration	Introduce the learning unit: Motivate the learner to create interest by asking some questions. Demonstrate following learning objectives: • Collect the design process instruction from an Engineer. • Follow the instructions to execute the design process. • Report problems occurred during the design process.		6 hrs
Conclusion			
	• Summarize the lesson by reviewing important facts. Also conclude the session, review the tools, techniques and material used for Execute repetitive/ manual design process . Give learners the opportunity to ask questions.		30 min
	<u>Assessment</u> Question and answer, discussion groups with feedback, observation of practice skills development		1 hr.
Total time:			10 hrs

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Module-1 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Trainer's guidelines

Module 1:			
Learning Unit	Learning outcomes>	Delivery Context	Media
LU1:			
LU2:			
LU3:			
LU4:			

Module 1: 0714001050 Perform basic machining operations			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1: Interpret Assembly Drawings	Deliver an illustrated presentation on how to Interpret Assembly Drawings. Ensure you address the importance of the following points: • Recognize basics of lines used in engineering drawings • Understand different types of lines in engineering drawings • Understand types of drawing views • Identify assembly requirements according to drawings Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Interpret Assembly Drawings. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Sample drawing sheets or Sketches • Layout tools • Measuring devices (screw gauge, Vernier calliper) • Handheld calculator • Hacksaw • Special robot tool kit • P.P.E • Drill set • Drill machine • Grinder • Hacksaw • Drill set • Drill machine • Grinder • Turret lathe machine • Tool grinder

	to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Interpret Assembly Drawings. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		• Lathe cutting tools • Multi- process • welding equipment • Base metals • Welding machine • Engine lathe machine • Personal safety kits • Hardware complete tool kit
LU2: Perform Bench Work on Metallic Surfaces	Deliver an illustrated presentation on Perform Bench Work on Metallic Surfaces. Ensure you address the importance of the following points: • Perform Bench Work on Metallic Surfaces Carry-Out Sawing		As above

	• File the Work-Piece • Carry out Drilling Process • Produce Threads on Work-Piece • Perform Hand Reaming Display a flip chart showing the following key question: <i>'What are the challenges when Perform Bench Work on Metallic Surfaces?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the		
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	papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Perform Bench Work on Metallic Surfaces. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Prepare Lathe Machine for Different Operations	Invite an experienced expert to deliver a presentation on how to Prepare Lathe Machine for Different Operations. Ensure their presentation addresses the following important points: Prepare Materials for Lathe Operations • Select Tools and Equipment • Set Lathe Machine for Operations Learners need to devise 10 quiz questions with answers based on Prepare Lathe Machine for Different Operations. They must make sure their questions cover key topics for Prepare Lathe Machine for Different Operations. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Prepare Lathe Machine for Different Operations. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B,		As above

	who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Prepare Lathe Machine for Different Operations in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU4. Prepare Materials for Welding	Lead a brainstorm on ways to Prepare Materials for Welding. Use ideas from the brainstorm to explain the following key points: • Select and Mark Material/s as per Drawing/Job Requirement • Cut and Prepare Edge/s of Base Materials • Knowledge of welding equipment • Fit-up Base Materials • Knowledge of materials Display a slide or flip chart with a key question relating to Prepare Materials for Welding. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Prepare Materials for Welding. Learners must be able to practice and develop		As above
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	their knowledge and skills relating to Prepare Materials for Welding in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-2 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 2: 0714001051 Operate the electronic measuring instruments

Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Evaluate the measuring instrument	- Deliver an illustrated presentation on how to Evaluate the measuring instrument. Ensure you address the importance of the following points: Classify the instrument type (analogue/digital). - Check the type of power source needed. - Evaluate and assemble the device and probes with proper procedure (as per manual). - Perform zero error tests as described in the procedure. - Identify the measuring units/parameters of the device as per SOP. - Set the readability of the instrument with respect to range. - Record the findings and develop the report. Prepare either: - A flip chart - A PowerPoint slide - A handout ...showing the key topics about Evaluate the measuring instrument. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	- Electrical test bench - Multi-meter - Test probes - Hand glove - Analogy meter - DMM - Thermometer 2-channel AC/DC - Power supply 5V, 12V, 24V - Oscilloscope - Breadboard trainer - Power source (AC/DC) - Digital multi meter - Lux meter - Power meter - Power factor meter, - Frequency meter - Energy meter etc. - Electrical test bench - Digital Multi-meter

	After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Evaluate the measuring instrument. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		• Digital Power source (AC/DC) • Manual tools • Screw drivers • Tweezers Tool • Wire Cutter • Nose plier • Soldering iron • Sucker • Electrical test bench • Power source (AC/DC) • Oscilloscope
LU2.Operate Electrical Analogue measuring instruments	Invite an experienced expert to deliver a presentation on how to Operate Electrical Analogue measuring instruments. Ensure their presentation addresses the following important points: • Determine the type of electrical/electronic parameter to be measures. • Select the relevant measuring instrument as per parameter to be measured. • Test point identification for measurement. • Connect the instrument according to the prescribed method. • Follow the procedure for reading value on the display Learners need to devise 10 quiz questions with answers based		• Function generator • IC/components • Gold Aluminum Housed Wire wound Resistor-AH-50W-1k

	on Operate Electrical Analogue measuring instruments. They must make sure their questions cover key topics for Operate Electrical Analogue measuring instruments. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Operate Electrical Analogue measuring instruments. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Operate Electrical Analogue measuring instruments in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3.Operate digital measuring instruments	Lead a brainstorm on ways to Operate digital measuring instruments. Use ideas from the brainstorm to explain the following key points:		As Unit-1

	• Identify the type of quantity to be measures. • Select the relevant measuring instrument as per parameter to be measured. • Test point identification for measurement. • Connect the instrument according to the prescribed method. • Follow the procedure for reading value on the display Display a slide or flip chart with a key question relating to Operate digital measuring instruments. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Operate digital measuring instruments. Learners must be able to practice and develop their knowledge and skills relating to Operate digital measuring instruments in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Familiarize with basics of oscilloscope and function generator	Deliver an illustrated presentation on Familiarize with basics of oscilloscope and function generator. Ensure you address the importance of the following points: • Identify components and control knobs of oscilloscope. • Familiarize with operating panel and display control.		As Unit-1

	• Adjust screen resolution and calibrate screen with probes. • Measure the AC/DC signal on oscilloscope using function generator. Display a flip chart showing the following key question: <i>'What are the challenges when Familiarize with basics of oscilloscope and function generator?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Familiarize with basics of oscilloscope and function generator. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-3 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 3: 0714001052 Use measuring instruments for mechanics			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1.Take measurements with graduated tools	Deliver an illustrated presentation on Take measurements with graduated tools. Ensure you address the importance of the following points: • Take measurements using a Steel rule • Take measurements using a Hook rule • Take measurements using a Folding rule • Take measurements with Trammels Display a flip chart showing the following key question: <i>'What are the challenges when Take measurements with graduated tools?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Steel rule • Work piece • Surface plate • Steps and collars • Hook rule • Folding rule • Trammel • Combination set

	response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Take measurements with graduated tools. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2.Take measurements with combination set	Lead a brainstorm on ways to Take measurements with combination set. Use ideas from the brainstorm to explain the following key points: • Take Measurement with Square head • Perform levelling with square head as spirit level • Measure depth with square head as depth gauge • Measure height with square head as height gauge Display a slide or flip chart with a key question relating to Take measurements with combination set. Step 1 – Think Working on their own, each learner thinks about the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR • Access to a commercial environment or premises for training purposes	• Screw thread Micro meter • Vernier Calliper • Height Gauge • Vernier calliper • Dial thickness gauge • Dial indicator

	question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Take measurements with combination set. Learners must be able to practice and develop their knowledge and skills relating to Take measurements with combination set in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU3.Take measurements through various gauges	Invite an experienced expert to deliver a presentation on how to Take measurements through various gauges. Ensure their presentation addresses the following important points: • Take measurement with fixed gauge and plug gauge. • Take measurement with adjustable gauge • Take measurement with small hole gauge • Take measurement with telescope gauge Learners need to devise 10 quiz questions with answers based on Take measurements through various gauges. They must make sure their questions cover key topics for Take measurements through various gauges. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Take measurements through various gauges. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR • Access to a commercial environment or premises for training purposes	• Coordinate measuring machines • ISO tables of fits and tolerance • Measurement tools
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	passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Take measurements through various gauges in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
LU4. Perform measurements through Micro meter	Deliver an illustrated presentation on how to Perform measurements through Micro meter. Ensure you address the importance of the following points: • Take measurement with outside micro-meter • Take measurement with inside micro meter • Take measurement with depth micro meter • Measure threads with micro meter • Take measurement with Vernier micro meter Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Perform measurements through Micro meter. Go through all the key topics	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Surface plate • Scriber • Tri square • Divider • Round stock • Fix gauge • Telescope

	briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Perform measurements through Micro meter. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU5. Measure dimensions with Vernier tools	Deliver an illustrated presentation on how to Measure dimensions with Vernier tools. Ensure you address the importance of the following points: • Take measurement with Vernier calliper • Take measurement with height gauge • Take measurement with Vernier depth gauge Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Measure dimensions with Vernier tools. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Measure dimensions with Vernier tools. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR • Access to a commercial environment or premises for training purposes	• Surface plate • Radius gauge • Ring Gauge • Plug Gauge • Angle gauge • Adjustable gauge
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	you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU6. Perform different measurements	Deliver an illustrated presentation on Perform different measurements. Ensure you address the importance of the following points: • Take measurement with dial calliper • Take measurement with dial thickness gauge • Take measurement with dial Indicator • Exercise on gauge blocks • Exercise on tool makers microscope • Practice on Profile Projector • Practice Of Digital Instruments • Measure tolerance and allowance Display a flip chart showing the following key question: • <i>Define with some example types of gauge blocks</i> • <i>What are the challenges when Perform different measurements?</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Surface gauge • Dial indicator • Outside Micrometer • Inside Micrometer • Depth Micrometer • Gauge blocks • Tool makers microscope
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	At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Perform different measurements. Ensure that learners have the opportunity to ask questions to support their understanding.		
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ROBOTICS TECHNICIAN



Module-4 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 4: 0714001055 Identify security arrangements for robotics equipment			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Maintain Security logs	Deliver an illustrated presentation on how to Maintain Security logs. Ensure you address the importance of the following points: • 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 and consistency while maintaining logs. Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Maintain Security logs. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Maintain Security logs. Discuss these main points briefly with the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Personal Computers • Printer • Stationary items • Any Robotic Equipment with security protocol manual • Log books • Desk • Chairs

	whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU2. Follow Relevant Security Protocols	Deliver an illustrated presentation on Follow Relevant Security Protocols. Ensure you address the importance of the following points: • Identify relevant security protocols as per standard operating procedures. • Follow instructions as per standard operating procedures. Display a flip chart showing the following key question: <i>'What are the challenges when Follow Relevant Security Protocols?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Follow Relevant Security Protocols. Ensure that learners have the opportunity to ask questions to support their understanding.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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LU3. Audit Security Protocols	Invite an experienced expert to deliver a presentation on how to Audit Security Protocols. Ensure their presentation addresses the following important points: • 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 supervisor Learners need to devise 10 quiz questions with answers based on Audit Security Protocols. They must make sure their questions cover key topics for Audit Security Protocols. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Audit Security Protocols. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	skills relating to Audit Security Protocols in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-5 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 5: 0714001056 Operate Robots at workplace			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1.Perform basic/initial test before operation	Lead a brainstorm on ways to Perform basic/initial test before operation. Use ideas from the brainstorm to explain the following key points: • 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 Display a slide or flip chart with a key question relating to Perform basic/initial test before operation. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Perform	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Robotic Platform • Basic electronic Tool Kit

		basic/initial test before operation. Learners must be able to practice and develop their knowledge and skills relating to Perform basic/initial test before operation in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Suitability of workplace operation	Ensure of for	Deliver an illustrated presentation on Ensure Suitability of workplace for operation. Ensure you address the importance of the following points: • Identify suitable work environment for the robot. • Identify obstacles that effects robot operations • Prepare suitable work environment for the robot. • Ensure safety for the robotic equipment. Display a flip chart showing the following key question: <i>'What are the challenges when Ensure Suitability of workplace for operation?</i>	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Ensure Suitability of workplace for operation. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU3. Follow standard procedures for operating the robot	Deliver an illustrated presentation on how to Follow standard procedures for operating the robot. Ensure you address the importance of the following points: • 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. Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Follow standard procedures for operating the robot. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Follow standard procedures for operating the robot. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
LU4. Perform post operation test	Deliver an illustrated presentation on Perform post operation test. Ensure you address the importance of the following points: • Recognize appropriate post operation test for the particular robot • Follow standard operating procedure to perform post operation test • Generate post operation test report Display a flip chart showing the following key question: <i>'What are the challenges when Perform post operation test?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Perform post operation test. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-6 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 6: 0714001057 Distinguish equipment/components for assembling purpose			
Learning Unit	Learning Outcomes	Delivery context	Media
LU1. Identify different components for assembly	Deliver an illustrated presentation on how to Identify different components for assembly. Ensure you address the importance of the following points: • List all assembly components • Distinguish between different types of components based on various traits. • Label components Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Identify different components for assembly. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Mechanical tools: Hammer, Screwdrivers & Wrenches, Saw, Square, measuring tape, Vernier callipers, Files, Centre Punch, Drill Press, Hobby Tool, soldering station, wires stripper, Sharp utility knives, Hot glue guns, Arc Welder, Electric Heat Gun, Safety Goggles.

	recorded for their key topic for Identify different components for assembly. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Arrange components in order for assembly	Deliver an illustrated presentation on Arrange components in order for assembly. Ensure you address the importance of the following points: • Know about components from user manual • Identify order of assembly • Recognize required components • Arrange components according to identified order Display a flip chart showing the following key question: <i>'What are the challenges when Arrange components in order for assembly?'</i>	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Robot components kit related to: Manipulator, Actuator, End effector, Locomotion Device, Controller, Sensors

	Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Arrange components in order for assembly. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Identify tools/ equipment for assembly	Invite an experienced expert to deliver a presentation on how to Identify tools/ equipment for assembly. Ensure their presentation addresses the following important points:	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER	As Unit-1

	• List different types of tools • Select appropriate tools for assembly Learners need to devise 10 quiz questions with answers based on Identify tools/ equipment for assembly. They must make sure their questions cover key topics for Identify tools/ equipment for assembly. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Identify tools/ equipment for assembly. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners	Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Identify tools/ equipment for assembly in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Arrange tools/equipment for assembly	Lead a brainstorm on ways to Arrange tools/equipment for assembly. Use ideas from the brainstorm to explain the following key points: • Arrange tools according to identified order Display a slide or flip chart with a key question relating to Arrange tools/equipment for assembly. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Arrange tools/equipment for assembly.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	Learners must be able to practice and develop their knowledge and skills relating to Arrange tools/equipment for assembly in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Prepare workspace /environment for assembly	Lead a brainstorm on ways to Prepare workspace /environment for assembly. Use ideas from the brainstorm to explain the following key points: • Check space availability • Arrange racks for the equipment • Place components based on functionality • Ensure safety measures • Ensure availability of consumables • Ensure backup power source Display a slide or flip chart with a key question relating to Prepare workspace /environment for assembly. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Prepare workspace /environment for assembly. Learners must be able to practice and develop their knowledge and skills relating to Prepare workspace /environment for assembly in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
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ROBOTICS TECHNICIAN



Module-7 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 7: 0714001058 Do component testing for robotics			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Prepare testing work bench	Lead a brainstorm on ways to Prepare testing work bench. Use ideas from the brainstorm to explain the following key points: • Identify work bench components • Identify testing criteria according to given standard • Follow instructions to prepare test bench Display a slide or flip chart with a key question relating to Prepare testing work bench. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Prepare testing work bench. Learners must be able to practice and develop their knowledge and skills relating to Prepare testing work bench in an appropriate practical setting. Ensure that learners have the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Testing Work Bench • Testing Components of robot • Electrical tool kit • Mechanical tool kit • Computers • Stationary

	opportunity to ask questions to support their understanding.		
LU2. Identify SOPs for component testing	Invite an experienced expert to deliver a presentation on how to Identify SOPs for component testing. Ensure their presentation addresses the following important points: • Identify components that requires testing • Identify relevant testing procedures • List SOPs according to testing criteria Learners need to devise 10 quiz questions with answers based on Identify SOPs for component testing. They must make sure their questions cover key topics for Identify SOPs for	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a	

	component testing. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Identify SOPs for component testing. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Identify SOPs for component testing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding	commercial environment or premises for training purposes	
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LU3. Execute component test	Deliver an illustrated presentation on Execute component test. Ensure you address the importance of the following points: • Follow SOPs to perform component tests • Identify and log different performance parameters • Ensure safety parameters while component testing • Collect and compile test results • Validate test results Display a flip chart showing the following key question: <i>'What are the different parameters when Execute component test?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1
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	copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Execute component test. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU4. Report testing results	Deliver an illustrated presentation on how to Report testing results. Ensure you address the importance of the following points: Identify relevant templates for report writing • Prepare report on performance parameters • Prepare report on component faults • Report recommended solutions Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Report testing results. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Report testing results. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1
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	End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Verify Calibration status of testing equipment	Deliver an illustrated presentation on Verify Calibration status of testing equipment. Ensure you address the importance of the following points: • Identify absolute instrument for calibration • Identify Calibration parameters • Perform calibration test according to instructions • Compare calibration status with the instruction's manual • Report calibration status of the testing equipment Display a flip chart showing the following key question: <i>'brief different types of instrument used in testing when Verify Calibration status of testing equipment?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Verify Calibration status of testing equipment. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-8 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 8: 0714001059 Un Deploy robot at workplace			
Learning Unit	Learning Outcomes		Media
LU1. Halt operation of robot	Deliver an illustrated presentation on how to Halt operation of robot. Ensure you address the importance of the following points: • Identify procedure for shutting down of robot. • Follow steps provided in standard operating manual. • Ensure safety standards during the procedure. Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Halt operation of robot. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Halt operation of robot. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Electronic tool kit • Mechanical tool kit • Robotic Platform • Transportation means

	discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Prepare for environment undeployment	Deliver an illustrated presentation on Prepare environment for undeployment. Ensure you address the importance of the following points: • Identify tools and equipment required for unemployment • Arrange tools and equipment required • Ensure suitability of workplace for unemployment Display a flip chart showing the following key question: <i>‘What are the challenges when Prepare environment for undeployment?’</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Prepare environment for undeployment. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Uninstall robot	Invite an experienced expert to deliver a presentation on how to Uninstall robot. Ensure their presentation addresses the following important points: • Identify uninstallation procedure for robot from installation manual. • Follow standard procedure to uninstall the robot • Ensure safety of robotic components while uninstalling Learners need to devise 10 quiz questions with answers based on Uninstall robot. They must make sure their questions cover key topics for Uninstall robot. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Uninstall robot. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Uninstall robot in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Prepare components for transportation and storage (packing)	Lead a brainstorm on ways to Prepare components for transportation and storage (packing). Use ideas from the brainstorm to explain the following key points: Identify packaging requirement of components • Ensure proper packaging of components • Arrange components for transportation and storage. Display a slide or flip chart with a key question relating to Prepare components for transportation and storage (packing). Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Prepare components for transportation and storage (packing). Learners must be able to practice and develop their knowledge and skills relating to Prepare components for transportation and storage (packing) in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Transport and store components	Deliver an illustrated presentation on Transport and store components. Ensure you address the importance of the following points: • Identify mode of transportation. • Ensure safe loading /unloading of the robotic components • Ensure appropriate storage environment for components Display a flip chart showing the following key question: <i>‘What are the challenges when Transport and store components?’</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Transport and store components. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-9 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 9: 0714001060 De-commission robot at workplace			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Prepare environment for disassembling	Deliver an illustrated presentation on how to Prepare environment for disassembling. Ensure you address the importance of the following points: - Identify disassembling requirements - Perform pre-decommissioning checks such as Environment, health and safety (EHS). - Select appropriate tools for disassembling of robot. Prepare either: - A flip chart - A PowerPoint slide - A handout ...showing the key topics about Prepare environment for disassembling. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Prepare environment for disassembling. Discuss these main points briefly with the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	- Sample of disposable, repairable and reusable components - Mechanical Tool kit - Basic electronics kit

	whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Disassemble undeployed robot	Deliver an illustrated presentation on Disassemble undeployed robot. Ensure you address the importance of the following points: • Identify order of disassembling • Detach connections effectively • Follow the standard operating procedure for disassembling of robot Display a flip chart showing the following key question: <i>'Identify sequence when Disassemble undeployed robot?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As above

	learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Disassemble undeployed robot. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Classify reusable and repairable components	Invite an experienced expert to deliver a presentation on how to Classify reusable and repairable components. Ensure their presentation addresses the following important points: • Identify reusable and repairable components. • Sort reusable and repairable components. • Label reusable and repairable components. Learners need to devise 10 quiz questions with answers based on Classify reusable and repairable components. They must make sure their questions cover key topics for Classify reusable and repairable components.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As above

	Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Classify reusable and repairable components. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Classify reusable and repairable components in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Dispose discarded components	Lead a brainstorm on ways to Dispose discarded components. Use ideas from the brainstorm to explain the following key points: • Ensure that the component is not usable or repairable.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER	As above

	• Identify EHS procedure for dispose of discarded components • Ensure proper disposal of discarded components Display a slide or flip chart with a key question relating to Dispose discarded components. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Dispose discarded components. Learners must be able to practice and develop their knowledge and skills relating to Dispose discarded components in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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Module-10
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 10: 0714001062 Perform functional testing of robotics			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Identify desired functionality for testing	Deliver an illustrated presentation on how to Identify desired functionality for testing. Ensure you address the importance of the following points • 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 Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Identify desired functionality for testing. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Multi-meter • Oscilloscope • Computer systems • Professional Electronic toolkit • Professional Mechanical toolkit • RPM meter • Temperature meter • Torque meter • Barometer • Robotic system • Controller

	up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Identify desired functionality for testing. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU2. Execute relevant testing procedure	Deliver an illustrated presentation on Execute relevant testing procedure. Ensure you address the importance of the following points: • Prepare robotic unit for testing • Identify testing procedure to be executed • Select testing equipment to be used during tests • Indicate required results to be achieved • Execute testing steps in order • Compile results of all tests Display a flip chart showing the following key question: <i>‘What are the challenges when Execute relevant testing procedure?’</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1
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	responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Execute relevant testing procedure. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU3. Examine detailed functionality of interfaces	Invite an experienced expert to deliver a presentation on how to Examine detailed functionality of interfaces. Ensure their presentation addresses the following important points: • 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 functioning of the specific interface • Analyse examination results • Compile examination results Learners need to devise 10 quiz questions with answers based on Examine detailed functionality of interfaces. They must make sure their questions cover key topics for Examine detailed functionality of interfaces. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Examine detailed functionality of interfaces. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Examine detailed functionality of interfaces in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
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LU4. Examine detailed functionality of equipment	Lead a brainstorm on ways to Examine detailed functionality of equipment. Use ideas from the brainstorm to explain the following key points: 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 examination • Identify acceptable functionality of equipment • Examine equipment using specific tools • Analyze examination results • Compile examination results Display a slide or flip chart with a key question relating to Examine detailed functionality of equipment. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Examine detailed functionality of equipment. Learners must be able to practice and develop their	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	knowledge and skills relating to Examine detailed functionality of equipment in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Generate test report	Invite an experienced expert to deliver a presentation on how to Generate test report. Ensure their presentation addresses the following important points: • 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	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	• Assure quality of test report • Identify distribution of report Learners need to devise 10 quiz questions with answers based on Generate test report. They must make sure their questions cover key topics for Generate test report. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Generate test report. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Generate test report in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-11
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 11: 0714001063 Commission robot at workplace			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Prepare environment for commissioning of robot	Deliver an illustrated presentation on how to Prepare environment for commissioning of robot. Ensure you address the importance of the following points: - Specify environmental conditions for commissioning of robot. - Prepare suitable environment for commissioning of robot. - Arrange tools and equipment required for the commissioning of robot. Prepare either: - A flip chart - A PowerPoint slide - A handout ...showing the key topics about Prepare environment for commissioning of robot. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Prepare environment for commissioning of robot. Discuss these main points briefly with the whole	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	- Robotic system - Electronic tool kit - Mechanical tool kit - Computers - Printers

	group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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 Display a flip chart showing the following key question: <i>'Enlist all the list of tools require for Unbox robotic system?</i> <i>Also brief the importance of each tools?</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Unbox robotic system. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Comprehend commissioning and operational instructions	Invite an experienced expert to deliver a presentation on how to Comprehend commissioning and operational instructions. Ensure their presentation addresses the following important points: • Identify commissioning and operational manuals. • Follow commissioning and operational instructions from manual • Assist supervisor in commissioning steps provided in manual. Learners need to devise 10 quiz questions with answers based on Comprehend commissioning and operational instructions. They must make sure their questions cover key topics for Comprehend commissioning and operational	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	instructions. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Comprehend commissioning and operational instructions. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Comprehend commissioning and operational instructions in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Perform basic assembly	Lead a brainstorm on ways to Perform basic assembly. Use ideas from the brainstorm to explain the following key points: • Identify required basic assembly	Lab and Class room with multimedia aid, audio-visual facilities and flip charts.	

	• Prioritize basic assembly based on requirements • Follow instruction manual to perform basic assembly Display a slide or flip chart with a key question relating to Perform basic assembly. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Perform basic assembly. Learners must be able to practice and develop their knowledge and skills relating to Perform basic assembly in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
LU5. Perform initial testing of commissioned robot	Invite an experienced expert to deliver a presentation on how to Perform initial testing of commissioned robot. Ensure their presentation addresses the following important points: • Perform initial tests of commissioned robot.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility	

	• Follow steps for initial testing of robot. • Prepare initial testing report Learners need to devise 10 quiz questions with answers based on Perform initial testing of commissioned robot. They must make sure their questions cover key topics for Perform initial testing of commissioned robot. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Perform initial testing of commissioned robot. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Perform initial testing of commissioned robot in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding	OR Access to a commercial environment or premises for training purposes	
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Module-12 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 12: 0714001064 Deploy robot at workplace			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Prepare environment for deployment of robot	Deliver an illustrated presentation on how to Prepare environment for deployment of robot. Ensure you address the importance of the following points: - Specify environmental parameters for deployment of robot. - Identify suitable environment for deployment of robot. - Prepare suitable environment for deployment of robot. Prepare either: - A flip chart - A PowerPoint slide - A handout ...showing the key topics about Prepare environment for deployment of robot. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Prepare environment for	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	- Robotic system - Electronic tool kit - Mechanical tool kit - Computers - Printers - Transportation means

	deployment of robot. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
LU2. Transport robot and relevant system to deployment site	Deliver an illustrated presentation on Transport robot and relevant system to deployment site. Ensure you address the importance of the following points: • Identify transportation means for the robotic system. • Arrange transportation of the robot to the deployment site. • Ensure safe transportation of the robotic system. Display a flip chart showing the following key question: <i>'What are the challenges when Transport robot and relevant system to deployment site?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Transport robot and relevant system to deployment site. Ensure that learners have the opportunity to ask questions to support their understanding		
CU3. Install robot at site	Invite an experienced expert to deliver a presentation on how to Install robot at site. Ensure their presentation addresses the following important points: • Identify installation manuals. • Arrange tools and equipment required for the deployment of robot. • Follow instructions provided in manuals to install the robot at site. Learners need to devise 10 quiz questions with answers based on Install robot at site. They must make sure their	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	questions cover key topics for Install robot at site. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Install robot at site. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Install robot at site in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Execute initial testing of deployed robot	Lead a brainstorm on ways to Execute initial testing of deployed robot. Use ideas from the brainstorm to explain the following key points:	Lab and Class room with multimedia aid, audio-visual facilities and flip charts.	As unit-1

	• Comprehend initial tests of deployed robot. • Follow steps for initial testing of deployed robot. • Prepare initial testing report. Display a slide or flip chart with a key question relating to Execute initial testing of deployed robot. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Execute initial testing of deployed robot. Learners must be able to practice and develop their knowledge and skills relating to Execute initial testing of deployed robot in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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Module-13 TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 13: 0714001065 Monitor Operations of robot at workplace			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Identify desired outcomes of robot operations	Deliver an illustrated presentation on how to Identify desired outcomes of robot operations. Ensure you address the importance of the following points: - List all robot operation - Select robot operation for which outcomes have to be identified - List all possible outcomes of specified robot operation - Recognize important parameters to assess outcomes of robot operation. - Identify desired outcomes Prepare either: - A flip chart - A PowerPoint slide - A handout ...showing the key topics about Identify desired outcomes of robot operations. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	- Robotic system - Electronic tool kit - Mechanical tool kit - Computers - Printers - Transportation means

	Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Identify desired outcomes of robot operations. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
LU2. Examine outcomes against established thresh hold	Deliver an illustrated presentation on Examine outcomes against established thresh hold. Ensure you address the importance of the following points: • List established thresh holds for outcome • Assess outcomes of the robotic operation • Compare outcome against established thresh holds Display a flip chart showing the following key question: <i>'What are the challenges when Examine outcomes against established thresh hold?'</i>	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or	

	Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Examine outcomes against established thresh hold. Ensure that learners have the opportunity to ask questions to support their understanding.	premises for training purposes	
LU3. Identify short comings in outcomes	Invite an experienced expert to deliver a presentation on how to Identify short comings in outcomes. Ensure their presentation addresses the following important points: Examine errors in outcomes • Apply corrective measure to eliminate errors • Prepare operation report Learners need to devise 10 quiz questions with answers based on Identify short comings in outcomes. They	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR	

	must make sure their questions cover key topics for Identify short comings in outcomes. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Identify short comings in outcomes. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Identify short comings in outcomes in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Access to a commercial environment or premises for training purposes	
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LU4.Maintain historical log	Lead a brainstorm on ways to Maintain historical log. Use ideas from the brainstorm to explain the following key points: • Identify log parameter • Prepare routine log • Create sense of continuity and consistency while maintaining logs • Keep the log factual and detailed Display a slide or flip chart with a key question relating to Maintain historical log. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Maintain historical log. Learners must be able to practice and develop their knowledge and skills relating to Maintain historical log in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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Module-14
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 14: 0714001066 Perform assembling of equipment / components			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Comprehend assembly manual	Deliver an illustrated presentation on how to Comprehend assembly manual. Ensure you address the importance of the following points: • Acquire list of assembly manuals • Select relevant assembly/ installation manuals • Read instruction manual thoroughly • Mark relevant steps for assembly Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Comprehend assembly manual. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Comprehend assembly manual. Discuss these main points briefly with the whole group. Learners should make additional notes on the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Mechanical tools kit • Electrical tool kit • Robotic tool kit

	flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Prepare assembly plan	Deliver an illustrated presentation on Prepare assembly plan. Ensure you address the importance of the following points: • 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 Display a flip chart showing the following key question: <i>'What are the challenges when Prepare assembly plan?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Prepare assembly plan. Ensure that learners have the opportunity to ask questions to support their understanding.		
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LU3. Perform assembly as per SOP	Invite an experienced expert to deliver a presentation on how to Perform assembly as per SOP. Ensure their presentation addresses the following important points: • Ensure safety standards • Prepare a working environment for assembly • List all steps as per SOP. • Prioritize the assembly steps • Follow the assembly steps. Learners need to devise 10 quiz questions with answers based on Perform assembly as per SOP. They must make sure their questions cover key topics for Perform assembly as per SOP. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Perform assembly as per SOP. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Perform assembly as per SOP in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Verify assembly as per standards	Lead a brainstorm on ways to Verify assembly as per standards. Use ideas from the brainstorm to explain the following key points: • List all assemblies performed • Select assemblies that require verification • Identify verification procedure for selected assembly • 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 Display a slide or flip chart with a key question relating to Verify	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	assembly as per standards. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Verify assembly as per standards. Learners must be able to practice and develop their knowledge and skills relating to Verify assembly as per standards in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-15
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 15: 0714001072 Perform maintenance of robotics			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1.Develop maintenance schedule	Deliver an illustrated presentation on how to Develop maintenance schedule. Ensure you address the importance of the following points: • Identify equipment that require maintenance • Determine frequency of maintenance required • Prioritize required maintenance • Create database on equipment to be inspected and maintained • Draft maintenance plan Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Develop maintenance schedule. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Develop maintenance schedule. Discuss these main points briefly with the whole	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Mechanical tools kit • Electrical tool kit • Robotic tool kit • Robotic Platform

	group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Perform maintenance as per procedure standards and guidelines	Deliver an illustrated presentation on Perform maintenance as per procedure standards and guidelines . Ensure you address the importance of the following points: • Identify tool and equipment required for maintenance • Arrange tool and equipment required to perform maintenance at workplace • Read instruction manuals thoroughly to perform maintenance • Follow steps provided in standard procedure and guideline Display a flip chart showing the following key question: <i>‘Explain the how to arrange tools and equipment while Perform maintenance as per procedure standards and guidelines ?’</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Perform maintenance as per procedure standards and guidelines. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Supervise maintenance staff	T Invite an experienced expert to deliver a presentation on how to Supervise maintenance staff. Ensure their presentation addresses the following important points: • Formulate list of duties as per staff skill set • Assign duties to staff • Ensure individual and teamwork. • Ensure maintenance carried out as per standard procedure and guidelines. Learners need to devise 10 quiz questions with answers based on Supervise maintenance staff. They must make sure their questions cover key topics for Supervise maintenance staff. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	Supervise maintenance staff. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Supervise maintenance staff in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
LU4. Ensure timely maintenance to avoid negative outcomes	Lead a brainstorm on ways to Ensure timely maintenance to avoid negative outcomes. Use ideas from the brainstorm to explain the following key points: • Identify critical path in maintenance schedule • Ensure timely reminder are issued to the maintenance staff. • Ensure timely execution of activity in critical path. • Ensure strict adherence to overall maintenance schedule. Display a slide or flip chart with a key question relating to Ensure timely maintenance to avoid negative outcomes.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or	As Unit-1

	Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Ensure timely maintenance to avoid negative outcomes. Learners must be able to practice and develop their knowledge and skills relating to Ensure timely maintenance to avoid negative outcomes in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	premises for training purposes	
LU5. Perform component / functionality test after maintenance	Lead a brainstorm on ways to Perform component / functionality test after maintenance. Use ideas from the brainstorm to explain the following key points: • Identify post maintenance test. • Follow instruction to perform post maintenance test as per standard operating procedure. • Perform corrective measure to make sure smooth operation of system Display a slide or flip chart with a key question relating to Perform component / functionality test after maintenance. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for	As Unit-1

	important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Perform component / functionality test after maintenance. Learners must be able to practice and develop their knowledge and skills relating to Perform component / functionality test after maintenance in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding	training purposes	
LU6. Generate maintenance report	Lead a brainstorm on ways to Generate maintenance report. Use ideas from the brainstorm to explain the following key points: • Enlist results of functionality tests performed after maintenance • Formulate maintenance report • Propose any changes in maintenance plan This activity is based on a visit to an organisation. Learners will experience the process of Generate maintenance report and gather information on how this is completed. Prepare a short case study giving background information of the organisation you have chosen to visit. The information should include: • The organisation's name • Address of the organisation's premises • How long the organisation has been in business for • How many staff are employed.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As Unit-1

	Discuss the visit with your contact at the organisation. The organisation needs to prepare a short introduction they can deliver to the learners. The organisation will also need suitable staff to explain to the learners about Generate maintenance report. Ask whether there is any guidance the organisation has prepared on Generate maintenance report that is documented and request a copy of the document. A week before the visit, provide learners with a copy of the case study you have prepared describing the organisation. Hold a discussion with the learners on the key points of Generate maintenance report. Record these as bullet points on a flipchart and ensure learners make a copy. Ask learners to work in small groups. Each group needs to devise five questions about Generate maintenance report that they can ask when they visit the organisation. Ensure that learners bring their questions with them for the visit. Visit the organisation's premises with the learners. The organisation needs to deliver a short presentation to the learners about his business. The organisation then needs to introduce the staff members that will explain to the learners about Generate maintenance report. The staff members will then explain to the learners about Generate maintenance report. After the visit, ask learners to identify the main points identified during the visit that they found interesting or challenging. List these key points on a flip chart.		
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Module-16
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 16: 0714001073 Perform trouble shooting			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Identify the problem	Lead a brainstorm on ways to Identify the problem maintenance. Use ideas from the brainstorm to explain the following key points: • Examine the robotic system. • Enlist the identified problems. • Classify the problems. This activity is based on a visit to an organisation. Learners will experience the process of Identify the problem and gather information on how this is completed. Prepare a short case study giving background information of the organisation you have chosen to visit. The information should include: • The organisation's name • Address of the organisation's premises • How long the organisation has been in business for • How many staff are employed. Discuss the visit with your contact at the organisation. The organisation needs to prepare a short introduction they can deliver to the learners. The organisation will also need suitable staff to explain to the learners about Identify the problem. Ask whether there is any guidance the organisation has prepared on Identify the problem that is documented and request a copy of the document. A week before the visit, provide learners with a copy of the case study you have prepared describing the organisation. Hold a discussion with the learners on the key points of Identify the problem. Record these as bullet points on a flipchart and ensure	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Tool Kit (Electrical and Mechanical) • Robotic Platform • Computers • Printers • Notepads

	learners make a copy. Ask learners to work in small groups. Each group needs to devise five questions about Identify the problem that they can ask when they visit the organisation. Ensure that learners bring their questions with them for the visit. Visit the organisation's premises with the learners. The organisation needs to deliver a short presentation to the learners about his business. The organisation then needs to introduce the staff members that will explain to the learners about Identify the problem. The staff members will then explain to the learners about Identify the problem. After the visit, ask learners to identify the main points identified during the visit that they found interesting or challenging. List these key points on a flip chart.		
LU2. Gather more details related to problem	Lead a brainstorm on ways to Gather more details related to problem. Use ideas from the brainstorm to explain the following key points: • Identify reasons for the specified problem. • Observe the parameters and conditions at the time of problem occurred. • Prepare a detailed report on the problem. Display a slide or flip chart with a key question relating to Gather more details related to problem. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Gather more details related to problem. Learners must be able to practice and develop their knowledge and skills relating to Gather more details related to problem in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
LU3. Identify possible solutions	Invite an experienced expert to deliver a presentation on how to Identify possible solutions. Ensure their presentation addresses the following important points: • Identify the troubleshooting manual. • Specify the corrective measures from the troubleshooting manual. • Arrange tools and equipment required to attempt fixing the problem. Learners need to devise 10 quiz questions with answers based on Identify possible solutions. They must make sure their questions cover key topics for Identify possible solutions. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Identify possible solutions. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Identify possible solutions in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4. Attempt a fix based on findings	Deliver an illustrated presentation on Attempt a fix based on findings. Ensure you address the importance of the following points: • Follow instructions from troubleshooting manual to resolve the problem. • Gather more information and repeat if the problem is not resolved. • Make a detailed report on rectification of the problem. Display a flip chart showing the following key question: <i>'What are the challenges when Attempt a fix based on findings?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Attempt a fix based on findings. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Generate diagnostic report	Deliver an illustrated presentation on how to Generate diagnostic report. Ensure you address the importance of the following points: • Note the parameters and conditions after fixing the problem. • Prepare a comprehensive report on the observations and rectification of the problem. • Maintain error logs. Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Generate diagnostic report. Go through all the key topics briefly and then allocate one key topic to	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Generate diagnostic report. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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ROBOTICS TECHNICIAN



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Module-17
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 17: 0714001074 Revise the configuration of robotics			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Verify detailed functionality of equipment	Deliver an illustrated presentation on how to Verify detailed functionality of equipment. Ensure you address the importance of the following points: • Identify functionality tests for checking robot • Perform functionality test for robot • Ensure proper functionality of the equipment Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Verify detailed functionality of equipment. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Verify detailed functionality of equipment. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	Robotic System Mechanical Tool Kit Electronic Tool Kit Laptops

	discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Verify detailed functionality of interface	Deliver an illustrated presentation on Verify detailed functionality of equipment. Ensure you address the importance of the following points: • Identify interfacing modules for robot • Perform functionality test • Ensure proper functionality of the interface modules Display a flip chart showing the following key question: <i>'What are the challenges when Verify detailed functionality of equipment?</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Verify detailed functionality of equipment. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Identify task that require re-configuration of equipment	Invite an experienced expert to deliver a presentation on how to Identify task that require re-configuration of equipment. Ensure their presentation addresses the following important points: • Specify the task which will require re configuration. • List required tool and equipment for reconfiguration. • List down robotic components necessary for reconfiguration Learners need to devise 10 quiz questions with answers based on Identify task that require re-configuration of equipment. They must make sure their questions cover key topics for Identify task that require re-configuration of equipment. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Identify task that require re-configuration of equipment. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

		answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Identify task that require re-configuration of equipment in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU4.	Ensure of	Lead a brainstorm on ways to Ensure integration of reconfigured equipment. Use ideas from the brainstorm to explain the following key points: • Arrange robotic components necessary for reconfiguration • Identify standard procedure for integration • Perform integration of reconfigured equipment Display a slide or flip chart with a key question relating to Ensure integration of reconfigured equipment. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Ensure integration of reconfigured equipment. Learners must be able to practice and develop their knowledge and skills relating to Ensure integration of reconfigured equipment in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Upgrade software modules	Lead a brainstorm on ways to Upgrade software modules maintenance. Use ideas from the brainstorm to explain the following key points: • Identify software modules that require up gradation • Backup existing software and configuration. • Perform up gradation of software modules according to the SOP. This activity is based on a visit to an organisation. Learners will experience the process of Upgrade software modules and gather information on how this is completed. Prepare a short case study giving background information of the organisation you have chosen to visit. The information should include: • The organisation's name • Address of the organisation's premises • How long the organisation has been in business for • How many staff are employed.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	Discuss the visit with your contact at the organisation. The organisation needs to prepare a short introduction they can deliver to the learners. The organisation will also need suitable staff to explain to the learners about Upgrade software modules. Ask whether there is any guidance the organisation has prepared on Upgrade software modules that is documented and request a copy of the document. A week before the visit, provide learners with a copy of the case study you have prepared describing the organisation. Hold a discussion with the learners on the key points of Upgrade software modules. Record these as bullet points on a flipchart and ensure learners make a copy. Ask learners to work in small groups. Each group needs to devise five questions about Upgrade software modules that they can ask when they visit the organisation. Ensure that learners bring their questions with them for the visit. Visit the organisation's premises with the learners. The organisation needs to deliver a short presentation to the learners about his business. The organisation then needs to introduce the staff members that will explain to the learners about Upgrade software modules. The staff members will then explain to the learners about Upgrade software modules. After the visit, ask learners to identify the main points identified during the visit that they found interesting or challenging. List these key points on a flip chart. Learners must be able to practice and develop their knowledge and skills relating to Upgrade software modules in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU6. Ensure testing and smooth functionality of	Lead a brainstorm on ways to Ensure testing and smooth functionality of equipment. Use ideas from the brainstorm to explain the following key points:	Lab and Class room with multimedia aid, audio-visual facilities and flip	As unit-1

equipment	• Identify standard testing procedures. • Perform functionality test of the reconfigured equipment • Ensure proper functionality of the reconfigured equipment • Maintain log of equipment reconfiguration Display a slide or flip chart with a key question relating to Ensure testing and smooth functionality of equipment. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Ensure testing and smooth functionality of equipment. Learners must be able to practice and develop their knowledge and skills relating to Ensure testing and smooth functionality of equipment in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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Module-18
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 18: 0714001075 Execute up-gradation of robotics			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Identify current state of equipment for up- gradation	Lead a brainstorm on ways to Identify current state of equipment for up- gradation maintenance. Use ideas from the brainstorm to explain the following key points: • Identify reason for up-gradation of equipment • Identify tasks and related component that need up-gradation • Ensure need to upgrade equipment This activity is based on a visit to an organisation. Learners will experience the process of Identify current state of equipment for up- gradation and gather information on how this is completed. Prepare a short case study giving background information of the organisation you have chosen to visit. The information should include: • The organisation's name • Address of the organisation's premises • How long the organisation has been in business for • How many staff are employed. Discuss the visit with your contact at the organisation. The organisation needs to prepare a short introduction they can deliver to the learners. The organisation will also need suitable staff to explain to the learners about Identify current state of equipment for up- gradation. Ask whether there is any guidance the organisation has prepared on Identify current state of equipment for up-gradation that is documented and request a copy of the	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Robotic system • Mechanical tool kit • Electrical tool Kit • Personal Computers / Laptops • Notebook

	document. A week before the visit, provide learners with a copy of the case study you have prepared describing the organisation. Hold a discussion with the learners on the key points of Identify current state of equipment for up-gradation. Record these as bullet points on a flipchart and ensure learners make a copy. Ask learners to work in small groups. Each group needs to devise five questions about Identify current state of equipment for up- gradation that they can ask when they visit the organisation. Ensure that learners bring their questions with them for the visit. Visit the organisation's premises with the learners. The organisation needs to deliver a short presentation to the learners about his business. The organisation then needs to introduce the staff members that will explain to the learners about Identify current state of equipment for up-gradation. The staff members will then explain to the learners about Identify current state of equipment for up-gradation. After the visit, ask learners to identify the main points identified during the visit that they found interesting or challenging. List these key points on a flip chart. Learners must be able to practice and develop their knowledge and skills relating to Identify current state of equipment for up- gradation in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Recommend up-gradation of specific equipment	Lead a brainstorm on ways to Recommend up-gradation of specific equipment . Use ideas from the brainstorm to explain the following key points:	Lab and Class room with multimedia aid, audio-visual	As unit-1

	- List components of equipment need to be upgraded - List the new upgraded equipment - Prepare report on recommended equipment Display a slide or flip chart with a key question relating to Recommend up-gradation of specific equipment. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Recommend up-gradation of specific equipment. Learners must be able to practice and develop their knowledge and skills relating to Recommend up-gradation of specific equipment in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
LU3. Install / replace software modules	Invite an experienced expert to deliver a presentation on how to Install / replace software modules. Ensure their presentation addresses the following important points:	Lab and Class room with multimedia aid, audio-visual facilities and flip	As unit-1

	• Identify software module that needs replacement • Follow standard procedure for up-gradation of software modules • Report software modules upgraded Learners need to devise 10 quiz questions with answers based on Install / replace software modules. They must make sure their questions cover key topics for Install / replace software modules. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Install / replace software modules. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to	charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Install / replace software modules in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
LU4. Install / replace physical components	Deliver an illustrated presentation on Install / replace physical components. Ensure you address the importance of the following points: • Identify physical component that need replacement • Follow standard procedure for up-gradation of physical modules • Report physical components upgraded • Ensure proper packaging and storage of replaced modules Display a flip chart showing the following key question: <i>'Identify those components which need to be replace while Install / replace physical components?'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Install / replace physical components. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU5. Perform post up-gradation test	Deliver an illustrated presentation on how to Perform post up-gradation test. Ensure you address the importance of the following points: : • List post up-gradation tests • Follow post up-gradation test as per standard operating procedure • Evaluate and report post up-gradation tests results Prepare either: • A flip chart • A PowerPoint slide • A handout	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	...showing the key topics about Perform post up-gradation test. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Perform post up-gradation test. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU6. Ensure expected outcomes	Invite an experienced expert to deliver a presentation on how to Ensure expected outcomes. Ensure their presentation addresses the following important points:	Lab and Class room with multimedia aid, audio-visual facilities and flip	As unit-1

	• List expected outcome of up-gradation • Compare expected and evaluated post up-gradation results • Ensure corrective measures to achieve expected outcome Learners need to devise 10 quiz questions with answers based on Ensure expected outcomes. They must make sure their questions cover key topics for Ensure expected outcomes. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Ensure expected outcomes. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to	charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Ensure expected outcomes in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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Module-19
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 19: 0714001076 Develop 3D simulations			
Learning Unit	Learning Outcomes	Delivery Context	Media
LU1. Manage 3D modelling tools	Deliver an illustrated presentation on how to Manage 3D modelling tools. Ensure you address the importance of the following points: - List the available modelling tools The Trainee must be able to: - Select the required/related modelling tools - Keep an up to date documentation of modelling tools with respect to compatibility - Upgrading and troubleshooting modelling tools Prepare either: - A flip chart - A PowerPoint slide - A handout ...showing the key topics about Manage 3D modelling tools. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	3D modeling tools (e.g. AutoCAD, Google sketches) 3D simulation tools (e.g. Proteus and other simulation software of robots) - Laptop (for running software)

	to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Manage 3D modelling tools. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU2. Build models in 3D environment	Deliver an illustrated presentation on Build models in 3D environment. Ensure you address the importance of the following points: • List the available simulation modes. • Select the required simulation mode. • Interpret the given design specifications • Formulate the procedure to design the model • Design the model according to specifications • Cross-check design specifications with the built model Display a flip chart showing the following key question:	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	As unit-1

	<i>'how to rectify the challenges when</i> Build models in 3D environment?<i>'</i> Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Build models in 3D environment. Ensure that learners have the opportunity to ask questions to support their understanding.		
LU3. Simulate 3D models	Invite an experienced expert to deliver a presentation on how to Simulate 3D models. Ensure their presentation addresses the following important points: • Prepare modelling tool for simulation. • Run basic simulation according to specifications	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility	As unit-1

	• Generate basic G-codes • Prepare feasibility report Learners need to devise 10 quiz questions with answers based on Simulate 3D models. They must make sure their questions cover key topics for Simulate 3D models. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about Simulate 3D models. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Simulate 3D models in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	OR Access to a commercial environment or premises for training purposes	
LU4. Convert / generate	Lead a brainstorm on ways to Convert / generate coordinating system for 3D model . Use ideas from the brainstorm to explain	Lab and Class room with multimedia aid,	As unit-1

coordinating system for 3D model	the following key points: • Generate system coordinates according to deployment requirements • Translate generated coordinates to physical workplace Display a slide or flip chart with a key question relating to Convert / generate coordinating system for 3D model. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Convert / generate coordinating system for 3D model. Learners must be able to practice and develop their knowledge and skills relating to Convert / generate coordinating system for 3D model in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
LU5. Test generated G-Code	Lead a brainstorm on ways to Test generated G-Code maintenance. Use ideas from the brainstorm to explain the following key points:	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER	As unit-1

	• Set up working environment for sample testing • Acquire sample work piece • Perform practical implementation of the generated G-code • Prepare performance report This activity is based on a visit to an organisation. Learners will experience the process of Test generated G-Code and gather information on how this is completed. Prepare a short case study giving background information of the organisation you have chosen to visit. The information should include: • The organisation's name • Address of the organisation's premises • How long the organisation has been in business for • How many staff are employed. Discuss the visit with your contact at the organisation. The organisation needs to prepare a short introduction they can deliver to the learners. The organisation will also need suitable staff to explain to the learners about Test generated G-Code. Ask whether there is any guidance the organisation has prepared on Test generated G-Code that is documented and request a copy of the document. A week before the visit, provide learners with a copy of the case study you have prepared describing the organisation. Hold a discussion with the learners on the key points of Test generated G-Code. Record these as bullet points on a flipchart and ensure learners make a copy. Ask learners to work in small groups. Each group needs to devise five questions about Test generated G-Code that they can ask when they visit the organisation. Ensure that learners bring their questions with them for the visit. Visit the organisation's premises with the learners. The	Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	
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	organisation needs to deliver a short presentation to the learners about his business. The organisation then needs to introduce the staff members that will explain to the learners about Test generated G-Code. The staff members will then explain to the learners about Test generated G-Code. After the visit, ask learners to identify the main points identified during the visit that they found interesting or challenging. List these key points on a flip chart. Learners must be able to practice and develop their knowledge and skills relating to Test generated G-Code in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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ROBOTICS TECHNICIAN



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Module-20
TRAINER GUIDE

National Vocational Certificate Level 1-4

Version 1 - October, 2019

Module 20: 0714001077 Assist engineers in design, configuration and application			
Learning Unit	Learning Outcomes	Delivery Context	Media
CU1. Execute repetitive/ manual design process	Deliver an illustrated presentation on how to Execute repetitive/ manual design process. Ensure you address the importance of the following points: • Collect the design process instruction from an Engineer. • Follow the instructions to execute the design process. • Report problems occurred during the design process. Prepare either: • A flip chart • A PowerPoint slide • A handout ...showing the key topics about Execute repetitive/ manual design process. Go through all the key topics briefly and then allocate one key topic to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record three main points from their discussions that relate to their key topic. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for Execute repetitive/ manual design process. Discuss these main points briefly with the whole group. Learners should make additional notes on the flip chart to record additional	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	• Tool Kits (electrical and mechanical) • Test bench • Computers • Printers • Tools for system calibration

	points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to drawing in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
CU2.Manage tools and equipment	Invite an experienced expert to deliver a presentation on how to Manage tools and equipment. Ensure their presentation addresses the following important points: • Identify tools and equipment to be used. • Follow instructions to arrange and calibrate the tools and equipment. • Ensure availability of tools and equipment for a specified job. • Gather the tools and equipment after completion of the job. Learners need to devise 10 quiz questions with answers based on Manage tools and equipment. They must make sure their questions cover key topics for Manage tools and equipment. Issue each learner with 10 blank cards. Each learner should	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility OR Access to a commercial environment or premises for training purposes	

	number the cards and write their name on one side with a question about Manage tools and equipment. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to Manage tools and equipment in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding		
CU3. Execute test plan	Lead a brainstorm on ways to Execute test plan. Use ideas from the brainstorm to explain the following key points: • Prepare the test environment. • Arrange test tools and equipment.	Lab and Class room with multimedia aid, audio-visual facilities and flip charts. EITHER Training Workshop, or accommodation facility	

	• Follow instruction to perform test. • Report the results of the executed test. Display a slide or flip chart with a key question relating to Execute test plan. Step 1 – Think Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. Step 2 – Pair For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. Step 3 – Share The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to Execute test plan. Learners must be able to practice and develop their knowledge and skills relating to Execute test plan in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding	OR Access to a commercial environment or premises for training purposes	
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Frequently Asked Questions

1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?
Competency-based training (CBT) is an approach to vocational education and training that places emphasis on what a person can do in the workplace as a result of completing a program of training. Compared to conventional programs, the competency-based training is not primarily content based; it rather focuses on the competence requirement of the envisaged job role. The whole qualification refers to certain industry standard criterion and is modularized in nature rather than being course oriented.
2. What is the passing criterion for CBT certificate?
You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
3. What are the entry requirements for this course?
The entry requirement for this course is as given below as per 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
4. How can I progress in my educational career after attaining this certificate?
If you attained Level-1 of this course then you shall be able to take admission in Level-2, and further you shall follow the same for all level.
After completion of this course (From Level-1 to Level-4) it will help you to take admission in the National Vocational Certificate level-5, DAE or equivalent course. In certain case, you may be required to attain an equivalence certificate from The Inter Board Committee of Chairmen (IBCC).
5. If I have the experience and skills mentioned in the competency standards, do I still need to attend the course to attain this certificate?
No need to attain the course , you can enroll in the Recognition of Prior Learning (RPL) program by contacting the relevant training institute and getting assessed by providing the required evidences.
6. What is the entry requirement for Recognition of Prior Learning program (RPL)?
There is no general entry requirement. The institute shall assess you, identify your competence gaps and offer you courses to cover the gaps; after which you can take up the final assessment.
7. Is there any age restriction for entry in this course or Recognition of Prior Learning program?
There are no age restrictions to enter this course or take up the Recognition of Prior Learning program

(RPL)?

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| 8. What is the duration of this course? | The duration of the full from level-1 to level-4 is 24 months |
| 9. What are the class timings? | Classes are normally offered 22 days a month from 08:00am to 01:30pm, These may vary according to the practices of certain institutes, |
| 10. What is equivalence of this certificate with other qualifications? | As per the national vocational qualification's framework, the level-4 certificate is equivalent to Matriculation. The criteria for equivalence and equivalence certificate can be obtained from The Inter Board Committee of Chairmen (IBCC). |
| 11. What is the importance of this certificate in National and International job market? | This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTTC). These standards are also recognized worldwide as all the standards are coded using international methodology and are accessible to the employers worldwide through NAVTTTC website. |
| 12. Which jobs can I get after attaining this certificate? Are there job for this certificate in public sector as well? | You shall be able to take up jobs in the Robotics industries or the industry who's offer machine learning or automation system to their clients. |
| 13. What are possible career progressions in industry after attaining this certificate? | You shall be able to progress up to the level of supervisor after attaining sufficient experience, knowledge and skills during the job. Attaining additional relevant qualifications may aid your career advancement to even higher levels. |
| 14. Is this certificate recognized by any competent authority in Pakistan? | This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTTC). The official certificates shall be awarded by the relevant certificate awarding body. |
| 15. Is on-the-job training mandatory for this certificate? If yes, what is the duration of on-the-job training? | On-the-job training is not a requirement for final / summative assessment of this certificate. However, taking up on-the-job training after or during the course work may add your chances to get a job afterwards. |
| 16. How much salary can I get on job after attaining this certificate? | The minimum wages announced by the Government of Pakistan in 2019 are PKR 17,500. This may vary in subsequent years and different regions of the country. Progressive employers may pay more than the mentioned amount. |
| 17. Are there any alternative certificates which I can take up? | There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field. |
| 18. What is the teaching | The teaching language of this course is Urdu and English. |

language of this course?

19. Is it possible to switch to other certificate programs during the course? Not Completely, but if you attain Generic and functional competencies of this course , then you will get exemption from the same competencies and you will need to attain the technical competencies of any course.
20. What is the examination / assessment system in this program? Competency based assessments are organized by training institutes during the course which serve the purpose of assessing the progress and preparedness of each student. Final / summative assessments are organized by the relevant qualification awarding bodies at the end of the certificate program. You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
21. Does this certificate enable me to work as freelancer? Yes! You can start your small business of robotic products by registered yourself in the freelancing platform as a freelancer or consultant. You may need additional skills on entrepreneurship to support your initiative.

Test Yourself (Multiple Choice Questions)

Question	1	_____ is a drawing giving details about size tolerance, heat treatment, etc.	A	Exploded drawing
			B	Production drawing
			C	Assembly drawing
			D	Machine drawing
Question	2	Detailed drawing of each part of a machine is called.-----	A	Part drawing
			B	assembly drawing
			C	patent drawing
			D	tabular drawing

Question	3	In which operation, motion of job is rotary and motion of cutting tool is forward translating?	A	turning
			B	planning
			C	milling
			D	all of the mentioned
Question	4	Which type of cutting tools have wide application on lathes?	A	multi point
			B	single point
			C	both single point and multi point
			D	none of the mentioned
Question	5	In how many groups, cutting tools can be divided?	A	2
			B	3
			C	4
			D	None of the Above

Question	6	Which kind of resistance is experienced in upset butt welding?	A	Thermal resistance
			B	Magnetic resistance
			C	Electric resistance
			D	d) Air resistance
Question	7	Resistances can be measured with the help of a -----	A	Wattmeter
			B	voltmeter
			C	ammeter
			D	ohmmeter and resistance bridge
Question	8	The use of----- instruments is merely confined within laboratories as standardizing instruments.	A	absolute
			B	indicating
			C	recording
			D	integrating
Question	9	Which of the following have a low loading effect?	A	Electrical system
			B	Electronic system
			C	Both have equal effect
			D	None of the mentioned

Question	10	To increase the current sensitivity below 10 mV, electronic instrument uses	A	Oscillator
			B	Modulator
			C	Transducer
			D	Amplifiers
Question	11	What is the least count of a micrometer?	A	0.01 mm
			B	0.02 mm
			C	0.1 mm
			D	0.2 mm
Question	12	In physics, a common instrument to measure diameter of a circle is known as	A	rule
			B	measuring tape
			C	calipers
			D	inch tape
Question	13	Error due to eye vision is termed as	A	climax error
			B	sight error
			C	parallax error
			D	visional error

Question	14	Which of the following is incorrect for Vernier height gauge?	A	Surface plate is used as datum surface for measurements
			B	These gauges can be used for scribing purposes
			C	Removable clamps are used
			D	Both the surfaces of measuring jaw should be at 45° to the base
Question	15	What is the total error in micrometer?	A	Positive and negative deviation from the zero point
			B	Error in parallelism
			C	Deviation from measurement of a nominal dimension
			D	Maximum difference between ordinates of cumulative error

Question	16	A measuring tape can measure length more than a/an	A	meter
			B	inch but less than a foot
			C	foot but less than a meter
			D	centimeter
Question	17	Why these 4 elements (confidentiality, integrity, authenticity & availability) are considered fundamental?	A	They help understanding hacking better
			B	They are key elements to a security breach
			C	They help understands security and its components better
			D	They help to understand the cyber-crime better
Question	18	_____ ensures the integrity and security of data that are passing over a network	A	Firewall
			B	Antivirus
			C	Pentesting Tools
			D	Network-security protocols
Question	19	SSL primarily focuses on _____	A	Integrity and authenticity
			B	Integrity and non-repudiation
			C	Authenticity and privacy
			D	Confidentiality and integrity

Question	20	Which of the following are forms of malicious attack?	A	Theft of information
			B	Modification of data
			C	Wiping of information
			D	All of the mentioned
Question	21	From the following, which is not a common file permission?	A	Write
			B	Execute
			C	Stop
			D	Read
Question	22	Which of the following is the least secure method of authentication?	A	Key card
			B	fingerprint
			C	retina pattern
			D	Password
Question	23	What is the name for information sent from robot sensors to robot controllers?	A	temperature
			B	b) pressure
			C	feedback
			D	d) signal

Question	24	What is the name for space inside which a robot unit operates?	A	environment
			B	spatial base
			C	work envelope
			D	exclusion zone
Question	25	Which of the following terms IS NOT one of the five basic parts of a robot?	A	peripheral tools
			B	end effectors
			C	controller
			D	drive
Question	26	The number of moveable joints in the base, the arm, and the end effectors of the robot determines _____	A	flexibility
			B	payload capacity
			C	operational limits
			D	degrees of freedom

Question	27	For a robot unit to be considered a functional industrial robot, typically, how many degrees of freedom would the robot have?	A	three
			B	four
			C	six
			D	eight
Question	28	Which of the basic parts of a robot unit would include the computer circuitry that could be programmed to determine what the robot would do?	A	sensor
			B	controller
			C	arm
			D	end effector
Question	29	The collaborative robot arms are designed to mimic the range of motion of a _____	A	Network
			B	Machine arm
			C	Device
			D	Human arm

Question	30	Which of the following terms refers to the rotational motion of a robot arm?	A	swivel
			B	axle
			C	retrograde
			D	roll
Question	31	First step in validating a test is to	A	analyze the job
			B	choose the tests
			C	administer the tests
			D	Relate test scores
Question	32	A test's validity can be demonstrated in	A	Two ways
			B	Three ways
			C	Four ways
			D	Five ways
Question	33	The problem that threatens the success of a project but which has not yet happened is called as _____.	A	Bug
			B	Error
			C	Risk
			D	Defect

Question	34	When should Regression Testing to be performed?	A	When the project manager says
			B	After the software has changed.
			C	Whenever software testing team get the time.
			D	None of the above.
Question	35	Which of the following are objective of software testing?	A	Determines that software product satisfy specified requirements
			B	Demonstrate that software products are fit for use
			C	Detect defects
			D	All the above
Question	36	Which of the following terms refers to the use of compressed gasses to drive (power) the robot device?	A	Photosensitive
			B	hydraulic
			C	piezoelectric
			D	pneumatic

Question	37	With regard to the physics of power systems used operate robots, which statement or statements are most correct?	A	hydraulics involves the compression of liquids
			B	hydraulics involves the compression of air
			C	pneumatics involves the compression of air
			D	chemical batteries produce AC power
Question	38	Which of the following IS NOT one of the advantages associated with a robotics implementation program?	A	Low costs for hardware and software
			B	Robots work continuously around the clock
			C	Quality of manufactured goods can be improved
			D	Reduced company cost for worker fringe benefits
Question	39	Under the OSH Act, employers are responsible for providing a _____	A	Safe workplace
			B	b) Land
			C	c) Insurance
			D	d) Estimation

Question	40	Which of the following places would be LEAST likely to include operational robots?	A	warehouse
			B	factory
			C	hospitals
			D	private homes
Question	41	What are the common security threats?	A	File Shredding
			B	File sharing and permission
			C	File corrupting
			D	File integrity
Question	42	Which of the following is a good practice?	A	Give full permission for remote transferring
			B	Grant read only permission
			C	Grant limited permission to specified account
			D	Give both read and write permission but not execute
Question	43	Which of the following is a strong password?	A	19thAugust88
			B	Delhi88
			C	P@assw0rd
			D	!augustdelhi

Question	44	If a robot can alter its own trajectory in response to external conditions, it is considered to be _____	A	intelligent
			B	mobile
			C	open loop
			D	non-servo
Question	45	_____ refers to a different set of tasks ensures that the software that has been built is traceable to Customer Requirements.	A	Verification
			B	Requirement engineering
			C	Validation
			D	None of the above
Question	46	_____ verifies that all elements mesh properly and overall system functions/performance is achieved.	A	Integration testing
			B	Validation testing
			C	Unit testing
			D	System Testing

Question	47	What do you verify in White Box Testing?	A	Testing of each statement, object and function on an individual basis.
			B	Expected output.
			C	The flow of specific inputs through the code.
			D	All of the above.
Question	48	Who performs the Acceptance Testing while running the application of robot?	A	Software Developer
			B	End users
			C	Testing team
			D	Systems engineers
Question	49	Before handing over the software to the client, which testing is to be done in-house?	A	Alpha
			B	Beta
			C	Gamma
			D	Theta

Question	50	Applications such as robotics, expert systems, pattern recognition, artificial neural networks etc are	A	engineering software
			B	artificial Intelligence software
			C	system software
			D	product line software

Answer Key

Questions	Answer	Questions	Answer	Questions	Answer	Questions	Answer	Questions	Answer
1	B	11	A	21	C	31	A	41	B
2	A	12	C	22	D	32	A	42	C
3	A	13	C	23	C	33	C	43	C
4	B	14	D	24	C	34	B	44	A
5	A	15	D	25	A	35	D	45	C
6	C	16	A	26	D	36	D	46	C
7	D	17	C	27	C	37	C	47	D
8	A	18	D	28	B	38	B	48	B
9	B	19	A	29	D	39	A	49	A
10	D	20	B	30	B	40	D	50	B

