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# ARTIFICIAL INTELLIGENCE DATA TECHNICIAN



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## TRAINER GUIDE

National Vocational Certificate Level 4

Version 1 - November, 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 *Artificial intelligence data technician* 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 an *Artificial intelligence data technician* 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 internalized 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

<b>Course:</b> Artificial Intelligence Data Technician	<b>Total Course Duration:</b> 3200 hours
<b>Course Overview:</b>	
<p><i>The competency based NVQ has been developed to train the unskilled men and women of Pakistan on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by increase in their livelihood income generation.</i></p> <p><i>The purpose of these qualifications is to set professional standards for Artificial Intelligence Data Technician, who will serve as key elements enhancing quality of Pakistan's Software Developing Industry.</i></p>	

Module Title and Aim	Learning Units	Duration
<p><b>Module 22:</b> Contribute to Work Related Health and Safety (WHS) Initiatives</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Contribute to Work Related Health and Safety (WHS) Initiatives</p>	<p><b>LU1:</b> Contribute to initiate work-related health and safety measures  <b>LU2:</b> Contribute to establish work-related health and safety measures  <b>LU3:</b> Contribute to ensure legal requirements of WHS measures  <b>LU4:</b> Contribute to review WHS measures  <b>LU5:</b> Evaluate the organization's WHS system</p>	
<p><b>Module 23:</b> Comply with Workplace Policy and Procedures</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Comply with Workplace Policy and Procedures</p>	<p><b>LU1:</b> Respect work timeframes  <b>LU2:</b> Preparation for meeting  <b>LU3:</b> Decision making at workplace  <b>LU4:</b> Set and meet own work priorities  <b>LU5:</b> Develop and maintain professional competence  <b>LU6:</b> Follow and implement work safety requirements</p>	

Module Title and Aim	Learning Units	Duration
<p><b>Module 24:</b> Perform Advanced Communication</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Perform Advanced Communication</p>	<p><b>LU1:</b> Demonstrate professional skills  <b>LU2:</b> Plan and Organize work  <b>LU3:</b> Provide trainings at workplace</p>	
<p><b>Module 25:</b> Manage Human Resource Services</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Manage Human Resource Services</p>	<p><b>LU1:</b> Determine strategies for delivery of human resource services  <b>LU2:</b> Extract data as per requirement  <b>LU3:</b> Parse a web page with appropriate package  <b>LU4:</b> Extract data from an HTML tag  <b>LU5:</b> Parse xml /JSON</p>	
<p><b>Module 26:</b> Scrape data from the web</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Scrape data from the web</p>	<p><b>LU1:</b> Build a static web page  <b>LU2:</b> Create and manage specific working environment  <b>LU3:</b> Install Packages with Pip</p>	130hrs



Module Title and Aim	Learning Units	Duration
<p><b>Module 27:</b> Process Images through Image Processing Software</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Process Images through Image Processing Software</p>	<p><b>LU1:</b> Perform Basic Image Operations  <b>LU2:</b> Apply Image Filters  <b>LU3:</b> Change Color Spaces  <b>LU4:</b> Perform Geometrical Transformation  <b>LU5:</b> Perform Morphological Operations  <b>LU6:</b> Match Image Templates for object Recognition  <b>LU7:</b> Extract Foreground from the Image</p>	120hrs
<p><b>Module 28:</b> Work with Data Manipulation Toolkit</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed Work with Data Manipulation Toolkit</p>	<p><b>LU1:</b> Import Data  <b>LU2:</b> Index and Filter data  <b>LU3:</b> Perform Basic Column Level Operations  <b>LU4:</b> Handle missing data  <b>LU5:</b> Perform string level operations and Regex  <b>LU6:</b> Merge Data  <b>LU7:</b> Reshape Data  <b>LU8:</b> Apply Row/Cell level Operations</p>	150hrs
<p><b>Module 29:</b> Work with Multidimensional Arrays' Manipulation and Computation Package</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding</p>	<p><b>LU1:</b> Handle ndarray  <b>LU2:</b> Perform index ndarray  <b>LU3:</b> Operate on ndarray  <b>LU4:</b> Reshape ndarray  <b>LU5:</b> Merge ndarrays  <b>LU6:</b> Process Text Data</p>	150hrs

Module Title and Aim	Learning Units	Duration
needed to Work with Multidimensional Arrays' Manipulation and Computation Package	<b>LU7:</b> Handle new sources of Data	
<p><b>Module 30:</b> Develop Advance Computer Application Skills</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Develop Advance Computer Application Skills</p>	<p><b>LU1:</b> Manage Information System to complete a task</p> <p><b>LU2:</b> Prepare Presentation using computers</p> <p><b>LU3:</b> Use Microsoft Access to manage database</p> <p><b>LU4:</b> Develop graphics for Design</p>	
<p><b>Module 31:</b> Develop Entrepreneurial Skills</p> <p><b>Aim:</b> This module aims to develop the knowledge, skills and understanding needed to Develop Entrepreneurial Skills</p>	<p><b>LU1:</b> Develop a business plan</p> <p><b>LU2:</b> Collect information regarding funding sources</p> <p><b>LU3:</b> Develop a marketing plan</p> <p><b>LU4:</b> Develop basic business communication skills</p>	

**FORMAT FOR LESSON PLAN**

**Module26 : Scrape data from the web**

**Learning Unit 1: Build a static web page**

Methods	Key Notes	Media	Time
	The tools, material and techniques used to manipulate Image for Pre-processing		

**Introduction**

This session will introduce learners to the tools, techniques and material used for preparing workstation for winch dyeing, using presentation, demonstration, question and answer, and practical skills development.

**Main Body**

- Implement basic HTML tags
- Implement basic HTML attributes usage.
- Implement basic JavaScript behaviors.
- Perform inspection of a webpage.
- Create a basic webpage

**Conclusion**

To conclude the session, review the tools, techniques and material used for using IT Fundamentals to operate the computer. Give learners the opportunity to ask questions.

**Assessment**

Question and answer, discussion groups with feedback, observation of practice skills development

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**Trainer’s guidelines**

<b>Module 22: Contribute to Work Related Health and Safety (WHS) Initiatives</b>			
<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>

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Module-23

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**Module 23: Comply with Workplace Policy and Procedures**

<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
LU1:			
LU2:			
LU3:			
LU4:			

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**Module 24: Perform Advanced Communication**

<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
LU1:			
LU2:			
LU3:			
LU4:			

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Module-25

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**Module 25: Manage Human Resource Services**

<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
LU1:			
LU2:			
LU3:			
LU4:			

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Module-26

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**Module 26: 061900931 Scrape data from the web**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU1: Build a static web page</b></p>	<p>Invite an experienced colleague to deliver a presentation about how to Build a static web page. Ensure that the presentation addresses the following points</p> <ul style="list-style-type: none"> <li>- Implement basic HTML tags</li> <li>- Implement basic HTML attributes usage.</li> <li>- Implement basic JavaScript behaviors.</li> <li>- Perform inspection of a webpage.</li> <li>- Create a basic webpage</li> </ul> <p>Prepare a short case study giving background information of the AI expert. The information should include:</p> <ul style="list-style-type: none"> <li>• The AI expert's name</li> <li>• Address of the AI expert's organisation</li> <li>• How long the AI expert has been practising for</li> <li>• How many staff are employed by the organisation.</li> </ul> <p>Discuss the topic of how to Build a static web page with the invited AI expert. The AI expert needs to prepare a short introduction about their organisation they can deliver to the learners at the beginning of their presentation. Ask the AI expert to bring with him/her materials that will support the presentation, for example relevant resources, photographs, records.</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<p>A week before the presentation, provide learners with a copy of the case study you have prepared describing the AI expert's organisation. Hold a discussion with the learners on the key points of how to Build a static web page. Record these as bullet points on a flipchart and ensure learners make a copy.</p> <p>Ask learners to work in small groups. Each group needs to devise five questions about how to Build a static web page that they can ask during the presentation. Ensure that learners bring their questions with them for the presentation.</p> <p>On the day of the presentation, introduce the AI expert to the learners. The AI expert needs to deliver the presentation to the learners about their organisation and how their organisation manages how to Build a static web page. Following the presentation, ask selected learners to ask the questions they had devised. Encourage discussion about the key points of how to Build a static web page.</p> <p>Following the presentation, learners need to write up the answers to the questions their group had devised and submit these to you as part of their evidence.</p> <p>Demonstrate the materials needed for how to Build a static web page. Enable learners to practice using the appropriate materials for how to Build a static web page in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Build a static web page in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
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<p><b>LU2: Extract data as per requirement</b></p>	<p>Lead a discussion on how to Extract data as per requirement. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ul style="list-style-type: none"> <li>- Set request headers.</li> <li>- Set request cookie values where required</li> <li>- Configure a driver to some browser as required</li> <li>- Generate a request to webserver</li> <li>- Load response stream</li> <li>- Convert stream to page source/content</li> <li>- Read response headers</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about how to Extract data as per requirement. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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 how to Extract data as per requirement. Discuss these main points briefly with the</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>
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	<p>whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Extract data as per requirement. Enable learners to practice using the appropriate materials for how to Extract data as per requirement in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Extract data as per requirement in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding</p>		
<p><b>LU3: Parse a web page with appropriate package</b></p>	<p>Deliver an illustrated presentation on how to Parse a web page with appropriate package. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Perform installation of beautiful soup</li> <li>- Import package into program</li> <li>- Request a content to download</li> <li>- Find required content from page source</li> <li>- Append content</li> <li>- Convert content to a data frame</li> </ul>	<p>Practical Classrooms</p>	<p>labs, Learner Guide Handouts Videos Multi-media projector</p>



	<p>- Export data</p> <p>Learners need to devise 10 quiz questions with answers based on how to Parse a web page with appropriate package. They must make sure their questions cover key topics for how to Parse a web page with appropriate package.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to Parse a web page with appropriate package. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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.)</p> <p>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.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Parse a web page with appropriate package. Enable learners to practice</p>		
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	<p>using the appropriate materials for how to Parse a web page with appropriate package in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Parse a web page with appropriate package in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
	<p>Learner Guide</p> <p>Handouts</p> <p>Videos</p> <p>Multi-media projector</p>		
<b>LU5: Parse xml /JSON</b>	<p>Lead a discussion on how to Parse xml /JSON. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ul style="list-style-type: none"> <li>- Read xml/json file.</li> <li>- Create xml/json object.</li> <li>- Forward navigating through elements.</li> <li>- Backward navigation through elements.</li> <li>- Navigate through XPath</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> </ul>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide</p> <p>Handouts</p> <p>Videos</p> <p>Multi-media projector</p>

	<ul style="list-style-type: none"> <li>• A handout</li> </ul> <p>...showing the key topics about how to Parse xml /JSON. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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 how to Parse xml /JSON. Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Parse xml /JSON. Enable learners to practice using the appropriate materials for how to Parse xml /JSON in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Parse xml /JSON in an appropriate practical setting. Ensure that learners have</p>		
	<p>the opportunity to ask questions to support their understanding.</p>		

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Module-27

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**Module 27: 061900932 Process Images through Image Processing software**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU1: Perform Basic Image Operations</b></p>	<p>Lead a discussion on how to Perform Basic Image Operations. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ul style="list-style-type: none"> <li>- Read image from file</li> <li>- Display an image from data</li> <li>- Perform global threshold</li> <li>- Perform adaptive thresholding</li> <li>- Perform image sharpening</li> <li>- Perform image blurring using averaging</li> <li>- Perform image blurring using median</li> <li>- Perform image blurring using Gaussian</li> <li>- Perform image cropping</li> <li>- Find image contours</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about how to Perform Basic Image Operations. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p>	<p>Practical labs, Classrooms</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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 how to Perform Basic Image Operations. Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Perform Basic Image Operations. Enable learners to practice using the appropriate materials for how to Perform Basic Image Operations in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Perform Basic Image Operations in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
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<p><b>LU2: Apply Image Filters</b></p>	<p>Deliver an illustrated presentation on how to Apply Image Filters. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Creating 2D convolution filter</li> <li>- Apply Laplacian filter for edge detection</li> <li>- Apply X, Y Sobel filter on noisy images</li> <li>- Apply canny edge detection filter</li> <li>- Plot filtered images</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to Apply Image Filters. They must make sure their questions cover key topics for how to Apply Image Filters.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to Apply Image Filters. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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.)</p> <p>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.</p>	<p>Practical Classrooms</p>	<p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>
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	<p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Apply Image Filters. Enable learners to practice using the appropriate materials for how to Apply Image Filters in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Apply Image Filters in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU3: Change Color Spaces</b></p>	<p>Lead a brainstorm on how to Change Color Spaces List the brainstorm ideas on a flipchart. If necessary, prompt learners to consider the following:</p> <ul style="list-style-type: none"> <li>- Perform RGB to greyscale conversion</li> <li>- Perform RGB to HSV conversion</li> <li>- Perform RGB to LAB colour conversion</li> <li>- Perform RGB to YCrCb color conversion</li> </ul> <p>Prepare a short case study giving background information of the AI expert. The information should include:</p> <ul style="list-style-type: none"> <li>• The AI expert's name</li> <li>• Address of the AI expert's organisation</li> <li>• How long the AI expert has been practising for</li> <li>• How many staff are employed by the organisation.</li> </ul>	<p>Practical Classrooms labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>



	<p>Discuss the topic of how to : Change Color Spaces with the invited AI expert. The AI expert needs to prepare a short introduction about their organisation they can deliver to the learners at the beginning of their presentation. Ask the AI expert to bring with him/her materials that will support the presentation, for example relevant resources, photographs, records.</p> <p>A week before the presentation, provide learners with a copy of the case study you have prepared describing the AI expert's organisation. Hold a discussion with the learners on the key points of how to : Change Color Spaces Record these as bullet points on a flipchart and ensure learners make a copy.</p> <p>Ask learners to work in small groups. Each group needs to devise five questions about how to : Change Color Spaces that they can ask during the presentation. Ensure that learners bring their questions with them for the presentation.</p> <p>On the day of the presentation, introduce the AI expert to the learners. The AI expert needs to deliver the presentation to the learners about their organisation and how their organisation manages how to : Change Color Spaces Following the presentation, ask selected learners to ask the questions they had devised. Encourage discussion about the key points of how to : Install Packages with Pip.</p> <p>Following the presentation, learners need to write up the answers to the questions their group had devised and submit these to you as part of their evidence.</p> <p>Demonstrate the materials needed for how to : Change Color Spaces Enable learners to practice using the appropriate materials for how to : Install Packages with Pip in a controlled environment.</p>		
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	Learners must be able to practice and develop their knowledge and skills relating to how to Change Color Spaces in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
<b>LU4: Perform Geometrical Transformation</b>	<p>Lead a discussion on how to Perform Geometrical Transformation. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ul style="list-style-type: none"> <li>- Perform scaling operation on image</li> <li>- Perform image translation</li> <li>- Perform image rotation to any angle</li> <li>- Perform affine transformation</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about how to Perform Geometrical Transformation. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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</p>	Practical Classrooms labs,	Learner Guide Handouts Videos Multi-media projector

	<p>learners. Ask the group to share the main points they have recorded for their key topic for how to Perform Geometrical Transformation. Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Perform Geometrical Transformation. Enable learners to practice using the appropriate materials for how to Perform Geometrical Transformation in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Perform Geometrical Transformation in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU5: Perform Morphological Operations</b></p>	<p>Deliver an illustrated presentation on how to Perform Morphological Operations. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Creating 2D convolution filter</li> <li>- Apply Laplacian filter for edge detection</li> <li>- Apply X, Y Sobel filter on noisy images</li> </ul>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide</p> <p>Handouts</p> <p>Videos</p> <p>Multi-media projector</p>

	<ul style="list-style-type: none"> <li>- Apply canny edge detection filter</li> <li>- Plot filtered images</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to Perform Morphological Operations. They must make sure their questions cover key topics for how to Perform Morphological Operations.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to Perform Morphological Operations. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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.)</p> <p>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.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Perform Morphological Operations. Enable learners to practice using</p>		
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	<p>the appropriate materials for how to Perform Morphological Operations in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Perform Morphological Operations in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU6: Match Image Templates for object Recognition</b></p>	<p>Lead a brainstorm on how to Match Image Templates for object Recognition. List the brainstorm ideas on a flipchart. If necessary, prompt learners to consider the following:</p> <ul style="list-style-type: none"> <li>- Apply min max lock function</li> <li>- Perform template based object matching</li> <li>- Perform feature based object matching</li> <li>- Perform area based object matching</li> </ul> <p>Prepare a short case study giving background information of the AI expert. The information should include:</p> <ul style="list-style-type: none"> <li>• The AI expert’s name</li> <li>• Address of the AI expert’s organisation</li> <li>• How long the AI expert has been practising for</li> <li>• How many staff are employed by the organisation.</li> </ul> <p>Discuss the topic of how to : Match Image Templates for object Recognition with the invited AI expert. The AI expert needs to prepare a short introduction about their organisation they can deliver to the learners at the beginning of their presentation. Ask the AI expert to bring with him/her materials that will support the presentation, for example relevant resources, photographs, records.</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide</p> <p>Handouts</p> <p>Videos</p> <p>Multi-media projector</p>

	<p>A week before the presentation, provide learners with a copy of the case study you have prepared describing the AI expert's organisation. Hold a discussion with the learners on the key points of how to : Match Image Templates for object RecognitionRecord these as bullet points on a flipchart and ensure learners make a copy.</p> <p>Ask learners to work in small groups. Each group needs to devise five questions about how to : Match Image Templates for object Recognition that they can ask during the presentation. Ensure that learners bring their questions with them for the presentation.</p> <p>On the day of the presentation, introduce the AI expert to the learners. The AI expert needs to deliver the presentation to the learners about their organisation and how their organisation manages how to : Match Image Templates for object RecognitionFollowing the presentation, ask selected learners to ask the questions they had devised. Encourage discussion about the key points of how to : Install Packages with Pip.</p> <p>Following the presentation, learners need to write up the answers to the questions their group had devised and submit these to you as part of their evidence.</p> <p>Demonstrate the materials needed for how to : Match Image Templates for object Recognition Enable learners to practice using the appropriate materials for how to : Install Packages with Pip in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Match Image Templates for object Recognition in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
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<p><b>LU7: Extract Foreground from the Image</b></p>	<p>Deliver an illustrated presentation on how to Extract Foreground from the Image. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Apply grabcut technique for foreground extraction</li> <li>- Prepare image mask of suitable size</li> <li>- Apply image mask for foreground extraction</li> <li>- Perform series of basic image operations to extract foreground</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to Extract Foreground from the Image. They must make sure their questions cover key topics for how to Extract Foreground from the Image.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to Extract Foreground from the Image. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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.)</p> <p>The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<p>Player 1 of Team B, who asks their question to Player 1 of Team A, and so on.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Extract Foreground from the Image. Enable learners to practice using the appropriate materials for how to Extract Foreground from the Image in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Extract Foreground from the Image in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		



# ARTIFICIAL INTELLIGENCE DATA TECHNICIAN



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Module-28

TRAINER GUIDE

National Vocational Certificate Level 4

Version 1 - November, 2019

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**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU1: Import Data</b></p>	<p>Lead a discussion on how to import data. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ol style="list-style-type: none"> <li>1. Open a python script</li> <li>2. Import pandas</li> <li>3. Import a csv file using “read_csv” function</li> <li>4. Import an excel file using “read_excel” function</li> <li>5. Import from any other file type using appropriate “read” function</li> </ol> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about how to import data. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

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Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	<p>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 how to import data. Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to import data. Enable learners to practice using the appropriate materials for how to import data in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to import data in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		

**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU2: Index and Filter Data</b></p>	<p>Deliver an illustrated presentation on how to index and filter data. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Import data in a python script</li> <li>- Index columns using a list of columns</li> <li>- Index rows based on a list of index values</li> <li>- Index rows based on a conditional statement (mask)</li> <li>- Index columns based on a conditional statement (mask)</li> <li>- Index columns based on a range of columns</li> <li>- Index rows based on a range of index value</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to index and filter data. They must make sure their questions cover key topics for how to index and filter data.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to index and filter data. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

**Module 28: 061900933 Work with Data Manipulation Toolkit**

<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
	<p>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.)</p> <p>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.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p> <p>Demonstrate the materials needed for how to index and filter data. Enable learners to practice using the appropriate materials for how to index and filter data in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to index and filter data in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		

**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU3: Perform Basic Column Level Operations</b></p>	<p>Lead a brainstorm on how to Perform Basic Column Level Operations. List the brainstorm ideas on a flipchart. If necessary, prompt learners to consider the following:</p> <ul style="list-style-type: none"> <li>- Rename column</li> <li>- Apply a function element-wise to a column using “apply”</li> <li>- Get value counts of a column</li> <li>- Get sum of values in a column</li> <li>- Get basic stats of a column (mean/median/standard deviation etc.)</li> <li>- Change type of a column</li> <li>- Perform a vectorized arithmetic operation on a column</li> <li>- Delete a column</li> <li>- Duplicate a column</li> <li>- Group values of a column and apply an operation on each group</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	<p>...showing key topics for how to Perform Basic Column Level Operations. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify <b>three main points</b> that related to <b>each key topic</b>.</p> <p>After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic for how to Perform Basic Column Level Operations. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified.</p> <p>Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary.</p> <p>Demonstrate the materials needed for how to Perform Basic Column Level Operations. Enable learners to practice using the appropriate materials for how to Perform Basic Column Level Operations in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Perform Basic Column Level Operations in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		

**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU4: Handle missing data</b></p>	<p>Invite an experienced colleague to deliver a presentation about how to Handle missing data. Ensure that the presentation addresses the following points:</p> <ul style="list-style-type: none"> <li>- Count number of missing values in each column</li> <li>- Fill missing values with a specific string</li> <li>- Fill missing values with mean of the column</li> <li>- Delete rows with missing values</li> </ul> <p>Prepare a short case study giving background information of the AI expert. The information should include:</p> <ul style="list-style-type: none"> <li>• The AI expert’s name</li> <li>• Address of the AI expert’s organisation</li> <li>• How long the AI expert has been practising for</li> <li>• How many staff are employed by the organisation.</li> </ul> <p>Discuss the topic of how to Handle missing data with the invited AI expert. The AI expert needs to prepare a short introduction about their organisation they can deliver to the learners at the beginning of their presentation. Ask the AI expert to bring with him/her materials that will support the presentation, for example relevant resources, photographs, records.</p> <p>A week before the presentation, provide learners with a copy of the case study you have prepared describing the AI expert’s organisation. Hold a discussion with the learners on the key points of how to Handle missing data. Record these</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>



**Module 28: 061900933 Work with Data Manipulation Toolkit**

<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
	<p>as bullet points on a flipchart and ensure learners make a copy.</p> <p>Ask learners to work in small groups. Each group needs to devise five questions about how to Handle missing data that they can ask during the presentation. Ensure that learners bring their questions with them for the presentation.</p> <p>On the day of the presentation, introduce the AI expert to the learners. The AI expert needs to deliver the presentation to the learners about their organisation and how their organisation manages how to Handle missing data. Following the presentation, ask selected learners to ask the questions they had devised. Encourage discussion about the key points of how to Handle missing data.</p> <p>Following the presentation, learners need to write up the answers to the questions their group had devised and submit these to you as part of their evidence.</p> <p>Demonstrate the materials needed for how to Handle missing data. Enable learners to practice using the appropriate materials for how to Handle missing data in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Handle missing data in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		

**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU5: Perform string level operations and Regex</b></p>	<p>Lead a discussion on how to Perform string level operations and Regex. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ul style="list-style-type: none"> <li>- Convert a column to string</li> <li>- Divide a column into two based on a separator</li> <li>- Check if each row contains a specific substring</li> <li>- Extract substring out of each row in a column</li> <li>- Check if each row starts with a specific substring</li> <li>- Replace a specific substring in each row in a column</li> <li>- Change case of a string column</li> <li>- Strip spaces from the sides of each row in a column</li> <li>- Concatenate a value to each row in a column</li> <li>- Concatenate another column with a string column elementwise</li> <li>- Perform custom operations using “apply”</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> </ul>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
	<ul style="list-style-type: none"><li>• A handout</li></ul> <p>...showing the key topics about how to Perform string level operations and Regex. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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 how to Perform string level operations and Regex. Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Perform string level operations and Regex. Enable learners to practice using the appropriate materials for how to Perform</p>		

<b>Module 28: 061900933 Work with Data Manipulation Toolkit</b>			
<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
	<p>string level operations and Regex in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Perform string level operations and Regex in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<b>LU6: Merge Data</b>	<p>Deliver an illustrated presentation on how to merge data. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Merge two data frames using merge functions</li> <li>- Perform different types of joins on two dataframes</li> <li>- Concatenate two or more dataframes row wise</li> <li>- Concatenate two or more dataframes column wise</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to merge data. They must make sure their questions cover key topics for how to merge data.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to merge data. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

**Module 28: 061900933 Work with Data Manipulation Toolkit**

<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
	<p>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.)</p> <p>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.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p> <p>Demonstrate the materials needed for how to merge data. Enable learners to practice using the appropriate materials for how to merge data in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to merge data in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		

**Module 28: 061900933 Work with Data Manipulation Toolkit**

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU7: Reshape Data</b></p>	<p>Lead a brainstorm on xxx. List the brainstorm ideas on a flipchart. If necessary, prompt learners to consider the following:</p> <ul style="list-style-type: none"> <li>- Stack a dataframe</li> <li>- Unstack a dataframe</li> <li>- Create a pivot table</li> <li>- Melt a dataframe</li> <li>- Pivot a dataframe</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about xxx. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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 xxx. Discuss these main points briefly with the whole group. Learners should make</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

<b>Module 28: 061900933 Work with Data Manipulation Toolkit</b>			
<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
	<p>additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for xxx. Enable learners to practice using the appropriate materials for xxx in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to xxx in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<b>LU8: Apply Row/Cell level Operations</b>	Lead a discussion on how to Apply Row/Cell level Operations. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:	Practical Classrooms	labs, Learner Guide Handouts Videos Multi-media projector

	<ul style="list-style-type: none"> <li>- Count null values in a row</li> <li>- Drop/select specific rows based on a condition</li> <li>- Drop/select rows by index</li> <li>- Reset index of rows</li> <li>- Set a custom index of rows</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to Apply Row/Cell level Operations. They must make sure their questions cover key topics for how to Apply Row/Cell level Operations.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to Apply Row/Cell level Operations. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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.)</p> <p>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.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any</p>		
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**Module 28: 061900933 Work with Data Manipulation Toolkit**

<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
	<p>incorrect answers to learners and ask them to change their answer to the correct one.</p> <p>Demonstrate the materials needed for how to Apply Row/Cell level Operations. Enable learners to practice using the appropriate materials for how to Apply Row/Cell level Operations in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Apply Row/Cell level Operations in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		

# ARTIFICIAL INTELLIGENCE DATA TECHNICIAN



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Module-29

TRAINER GUIDE

National Vocational Certificate Level 4

Version 1 - November, 2019

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Module 29: 061900934 Work with Multidimensional Arrays' Manipulation and Computation Package

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU1: Handle ndarray</b></p>	<p>Lead a discussion on how to Handle ndarray. Encourage ALL trainees to participate in the discussion. Ensure that the discussion addresses the following points:</p> <ul style="list-style-type: none"> <li>- Read ndarray from pickle file</li> <li>- Write ndarray to a pickle file</li> <li>- Iterate over arrays</li> <li>- Append elements to an ndarray</li> <li>- Drop elements from ndarray</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about how to Handle ndarray. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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 how to Handle ndarray.</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<p>Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Handle ndarray. Enable learners to practice using the appropriate materials for how to Handle ndarray in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Handle ndarray in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU2: Perform Index ndarray</b></p>	<p>Deliver an illustrated presentation on how to Perform Index ndarray. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Perform basic slicing and indexing on ndarray</li> <li>- Index ndarray using a mask (Boolean array indexing)</li> <li>- Index ndarray using integer array indexing</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to Perform Index ndarray. They must make</p>	<p>Practical Classrooms labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<p>sure their questions cover key topics for how to Perform Index ndArray.</p> <p>Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to Perform Index ndArray. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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.)</p> <p>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.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Perform Index ndArray. Enable learners to practice using the appropriate materials for how to Perform Index ndArray in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Perform Index</p>		
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	<p>ndArray in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU3: Operate on ndarray</b></p>	<p>Invite an experienced colleague to deliver a presentation about Operate on ndarray. Ensure that the presentation addresses the following points:</p> <ul style="list-style-type: none"> <li>- Perform binary operations on arrays</li> <li>- Perform string operations on arrays</li> <li>- Perform comparison operations on arrays</li> <li>- Change type of an array</li> <li>- Split arrays (split, dsplit, vsplit, hsplit)</li> <li>- Tile arrays</li> <li>- Rearrange array (reshape, roll, flip)</li> </ul> <p>Prepare a short case study giving background information of the Artificial Intelligence expert. The information should include:</p> <ul style="list-style-type: none"> <li>• The Artificial Intelligence expert's name</li> <li>• Address of the Artificial Intelligence expert's organisation</li> <li>• How long the Artificial Intelligence expert has been practising for</li> <li>• How many staff are employed by the organisation.</li> </ul> <p>Discuss the topic of Operate on ndarray with the invited Artificial Intelligence expert. The Artificial Intelligence expert needs to prepare a short introduction about their organisation they can deliver to the learners at the beginning of their presentation. Ask the Artificial</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<p>Intelligence expert to bring with him/her materials that will support the presentation, for example relevant resources, photographs, records.</p> <p>A week before the presentation, provide learners with a copy of the case study you have prepared describing the Artificial Intelligence expert's organisation. Hold a discussion with the learners on the key points of Operate on ndarray. Record these as bullet points on a flipchart and ensure learners make a copy.</p> <p>Ask learners to work in small groups. Each group needs to devise five questions about Operate on ndarray that they can ask during the presentation. Ensure that learners bring their questions with them for the presentation.</p> <p>On the day of the presentation, introduce the Artificial Intelligence expert to the learners. The Artificial Intelligence expert needs to deliver the presentation to the learners about their organisation and how their organisation manages Operate on ndarray. Following the presentation, ask selected learners to ask the questions they had devised. Encourage discussion about the key points of Operate on ndarray.</p> <p>Following the presentation, learners need to write up the answers to the questions their group had devised and submit these to you as part of their evidence.</p> <p>Demonstrate the materials needed for Operate on ndarray. Enable learners to practice using the appropriate materials for Operate on ndarray in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to Operate on ndarray in an appropriate practical setting. Ensure that learners have the</p>		
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	opportunity to ask questions to support their understanding.		
<b>LU4: Reshape ndarray</b>	<p>Lead a brainstorm on Reshape ndarray. List the brainstorm ideas on a flipchart. If necessary, prompt learners to consider the following:</p> <ul style="list-style-type: none"> <li>- Change dimensions with “reshape”</li> <li>- Flatten array with “ravel”</li> <li>- Move axis of an array</li> <li>- Roll axis of an array</li> <li>- Swap axes of an array</li> <li>- Take transpose of an array</li> <li>- Broadcast an array</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about Reshape ndarray. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart.</p>	Practical Classrooms	labs, Learner Guide Handouts Videos Multi-media projector



	<p>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 Reshape ndarray. Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for Reshape ndarray. Enable learners to practice using the appropriate materials for Reshape ndarray in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to Reshape ndarray in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU5: Merge ndArrays</b></p>	<p>Deliver an illustrated presentation on how to Merge ndArrays. Ensure that the presentation focuses on the following:</p> <ul style="list-style-type: none"> <li>- Concatenate arrays</li> <li>- Stack arrays</li> </ul>	<p>Practical Classrooms      labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<ul style="list-style-type: none"> <li>- Stack 1D arrays as columns in a 2D array (column stack)</li> <li>- Perform stacking on particular axes (dstack, hstack, vstack)</li> </ul> <p>Learners need to devise 10 quiz questions with answers based on how to Merge ndArrays. They must make sure their questions cover key topics for how to Merge ndArrays. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to Merge ndArrays. On the reverse of the card, they should write an appropriate answer to their question.</p> <p>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.)</p> <p>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.</p> <p>Total the scores at the end of the quiz to see which team won.</p> <p>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.</p>		
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	<p>Demonstrate the materials needed for how to Merge ndArrays. Enable learners to practice using the appropriate materials for how to Merge ndArrays in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to Merge ndArrays in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU6: Process Text Data</b></p>	<p>Lead a brainstorm on how to process text data. List the brainstorm ideas on a flipchart. If necessary, prompt learners to consider the following:</p> <ul style="list-style-type: none"> <li>- Read text documents into variables</li> <li>- Tokenize text documents</li> <li>- Count number of unique words in a document</li> <li>- Convert a text document into a label encoded array</li> <li>- Encode a document phrase using one hot encoding</li> </ul> <p>Prepare either:</p> <ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing key topics for how to process text data. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify <b>three main points</b> that related to <b>each key topic</b>.</p> <p>After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<p>first key topic for how to process text data. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified.</p> <p>Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics.</p> <p>End the group discussion activity with a summary.</p> <p>Demonstrate the materials needed for how to process text data. Enable learners to practice using the appropriate materials for how to process text data in a controlled environment.</p> <p>Learners must be able to practice and develop their knowledge and skills relating to how to process text data in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.</p>		
<p><b>LU7: Handle new sources of Data</b></p>	<p>Deliver an illustrated presentation on how to Handle new sources of Data. Ensure that the presentation focuses on the following:</p> <ol style="list-style-type: none"> <li>1. Read Audio data as numpy array</li> <li>2. Read Image data as numpy array</li> <li>3. Read LIDAR data as numpy array</li> <li>4. Read Time Series data as numpy array</li> </ol> <p>Prepare either:</p>	<p>Practical Classrooms</p> <p>labs,</p>	<p>Learner Guide Handouts Videos Multi-media projector</p>

	<ul style="list-style-type: none"> <li>• A flip chart</li> <li>• A PowerPoint slide</li> <li>• A handout</li> </ul> <p>...showing the key topics about how to Handle new sources of Data. Go through all the key topics briefly and then allocate <b>one key topic</b> to each group.</p> <p>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 <b>three main points</b> from their discussions that relate to <b>their key topic</b>.</p> <p>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 how to Handle new sources of Data. Discuss these main points briefly with the whole group. Learners should make additional notes <b>on the flip chart</b> to record additional points their group had not identified.</p> <p>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.</p> <p>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.</p> <p>Demonstrate the materials needed for how to Handle new sources of Data. Enable learners to practice using the appropriate materials for how to Handle new sources of Data in a controlled environment.</p>		
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	Learners must be able to practice and develop their knowledge and skills relating to how to Handle new sources of Data in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.		
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## Frequently Asked Questions

<p>1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?</p>	<p>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.</p>
<p>2. What is the passing criterion for CBT certificate?</p>	<p>You shall be required to be declared “Competent” in the summative assessment to attain the certificate.</p>
<p>3. What are the entry requirements for this course?</p>	<p>The entry requirement for this course is 8th Grade or equivalent.</p>
<p>4. How can I progress in my educational career after attaining this certificate?</p>	<p>You shall be eligible to take admission in the National Vocational Certificate Level-3 in Artificial Intelligence Data Technician. You shall be able to progress further to National Vocational Certificate Level-4 in Artificial Intelligence Data Technician (Supervisor); and take admission in a 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).</p>
<p>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?</p>	<p>You can opt to take part in the Recognition of Prior Learning (RPL) program by contacting the relevant training institute and getting assessed by providing the required evidences.</p>
<p>6. What is the entry requirement for Recognition of Prior Learning program (RPL)?</p>	<p>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.</p>

7. Is there any age restriction for entry in this course or Recognition of Prior Learning program (RPL)?	There are no age restrictions to enter this course or take up the Recognition of Prior Learning program
8. What is the duration of this course?	The duration of the course work is 3220 hours
9. What are the class timings?	The classes are normally offered 25 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 artificial intelligence industry which comprises of development of applications for play store as well as testing and optimization of the apps.
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 language of this course?	The teaching language of this course is Urdu and English.
19. Is it possible to switch to other certificate programs during the course?	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.
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?	You can start your small business/ software house related to artificial intelligence and you can work as freelancer as well after the completion of the course. You may need additional skills on entrepreneurship to support your initiative.

## Test Yourself (Multiple Choice Questions)

### MODULE Scrap data from the web

- Question 1** What is the correct HTML for creating a hyperlink?
- A `<a href="http://www.w3schools.com">W3Schools</a>`
  - B `<a>http://www.w3schools.com </a>`
  - C `<a url="http://www.w3schools.com">W3Schools</a>`
  - D `<a name="http://www.w3schools.com">W3Schools</a>`
- Question 2** Which of these elements are all `<table>` elements?
- A `<table><tr><td>`
  - B `<table><tr><tt>`
  - C `<table><head><tfoot>`
  - D `<thead><body`

- Question 3** When trying to get or retrieve data from a specified resource, what HTTP method is used?
- A POST
  - B GET
  - C HEAD
  - D CONNECT

- Question 4** Which property of the `requests.Response` object returns the content of the response, in bytes?
- A `encoding`
  - B `request`
  - C `content`
  - D `cookies`

- Question 5** Which of the following objects from BeautifulSoup package represent the whole HTML document?
- A Tag
  - B NavigableString
  - C BeautifulSoup
  - D Comment

**MODULE**      **Process Images through Image Processing software**

- Question 6** Which is default missing value in pandas dataframe.
- A Not Found
  - B NULL
  - C NAN
  - D NaN

**Question 7** Mark the wrong statement

- A Primary difference between Series and ndarray is operations between Series automatically align the data based on label
- B NumPy methods accepting an ndarray can also accept Series instead.
- C DataFrame behaves as fixed-size dict where you can get and set values through index labels
- D DataFrames can be exported as excel files.

**Question 8** Which of the following works analogously to the form of the dict constructor?

- A DataFrame.from\_items
- B DataFrame.from\_records
- C DataFrame.from\_dict
- D DataFrame.Init

**Question 9** Pandas allows to load range of columns at initialize level.

A True

B False

C

D

**Question 10** Which of the following works analogously to the form of the dict constructor?

A DataFrame.from\_items

B DataFrame.from\_records

C DataFrame.from\_dict

D DataFrame.Init

**MODULE Work with Data Manipulation Toolkit**

**Question 11** Which of the following is contained in NumPy library?

- A n-dimensional array object
- B tools for integrating C/C++ and Fortran code
- C fourier transform
- D all of the Mentioned

**Question 12** The \_\_\_\_\_ function returns its argument with a modified shape, whereas the \_\_\_\_\_ method modifies the array itself.

- A reshape,resize
- B resize,reshape
- C reshape2,resize
- D all of the Mentioned

**Question 13** Which of the following function stacks 1D arrays as columns into a 2D array?

- A row\_stack
- B column\_stack
- C com\_stack
- D all of the Mentioned

**Question 14** ndarray is also known as the alias array.

- A True
- B False
- C
- D



- Question 15** Which of the following method creates a new array object that looks at the same data
- A view
  - B copy
  - C paste
  - D all of the Mentioned

**MODULE** Work with Multidimensional Arrays' Manipulation and Computation Package

- Question 16** ndarray.dataitemSize is the buffer containing the actual elements of the array
- A True
  - B False
  - C
  - D

**Question 17** How would you join the two arrays of train and test sets?

- A `resulting_set = train_set.append(test_set)`
- B `resulting_set = np.concatenate([train_set, test_set])`
- C `resulting_set = np.vstack([train_set, test_set])`
- D None of these

**Question 18** Correct syntax of the reshape() function in Numpy array python is

- A `array.reshape(shape)`
- B `reshape(shape,array)`
- C `reshape(array,shape)`
- D `reshape(shape)`

**Question 19** How we can convert the Numpy array to the list in python?

- A list(array)
- B list.array
- C array.list
- D None of the above

**Question 20** How we install Numpy in the system ?

- A install numpy
- B pip install python numpy
- C pip install numpy
- D pip install numpy python

## Answers

MODULE	Scrap data from the web		
Question	1	What is the correct HTML for creating a hyperlink?	A <code>&lt;a href="http://www.w3schools.com"&gt;W3Schools&lt;/a&gt;</code>
Question	2	Which of these elements are all <code>&lt;table&gt;</code> elements?	A <code>table&lt;tr&gt;&lt;td&gt;</code>
Question	3	When trying to get or retrieve data from a specified resource, what HTTP method is used?	B GET
Question	4	Which property of the <code>requests.Response</code> object returns the content of the response, in bytes?	C <code>content</code>
Question	5	Which of the following objects from BeautifulSoup package represent the whole HTML document?	C <code>BeautifulSoup</code>

**MODULE**    **Process Images through Image Processing software**

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|-----------------|----------|---|---|
| <b>Question</b> | <b>1</b> | Which is default missing value in pandas dataframe.                           | D    NaN  |
| <b>Question</b> | <b>2</b> | Mark the wrong statement  | C    DataFrame behaves as fixed-size dict where you can get and set values through index labels |
| <b>Question</b> | <b>3</b> | Which of the following works analogously to the form of the dict constructor? | C    DataFrame.from_dict  |
| <b>Question</b> | <b>4</b> | Pandas allows to load range of columns at initialize level.                   | A    True   |
| <b>Question</b> | <b>5</b> | Which of the following works analogously to the form of the dict constructor? | A    DataFrame.from_items   |

**MODULE**    **Work with Data Manipulation Toolkit**

- Question 1**    Which of the following is contained in NumPy library?    D    all of the Mentioned
- Question 2**    The \_\_\_\_\_ function returns its argument with a modified shape, whereas the \_\_\_\_\_ method modifies the array itself.    A    reshape,resize
- Question 3**    Which of the following function stacks 1D arrays as columns into a 2D array?    B    column\_stack
- Question 4**    ndarray is also known as the alias array.    A    True
- Question 5**    Which of the following method creates a new array object that looks at the same data    A    view

**MODULE**    **Work with Multidimensional Arrays' Manipulation and Computation Package**

<b>Question</b>	<b>1</b>	ndarray.dataitemSize is the buffer containing the actual elements of the array	A   True
<b>Question</b>	<b>2</b>	How would you join the two arrays of train and test sets?	C <code>resulting_set = np.vstack([train_set, test_set])</code>
<b>Question</b>	<b>3</b>	Correct syntax of the reshape() function in Numpy array python is	C <code>reshape(array,shape)</code>
<b>Question</b>	<b>4</b>	How we can convert the Numpy array to the list in python?	A <code>list(array)</code>
<b>Question</b>	<b>5</b>	How we install Numpy in the system?	C <code>pip install numpy</code>


## National Vocational and Technical Training Commission (NAVTTTC)

 Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan

 +92 51 9044 322

 +92 51 9044 322

 [info@navttc.org](mailto:info@navttc.org)

 [www.navttc.org](http://www.navttc.org)