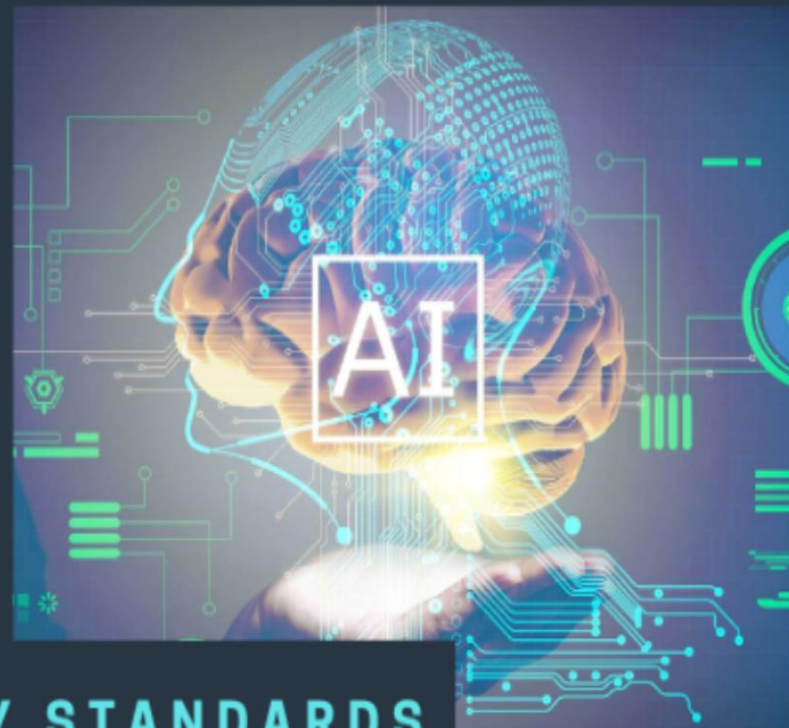


NATIONAL VOCATIONAL QUALIFICATION

ARTIFICIAL INTELLIGENCE

DAE - LEVEL 5



COMPETENCY STANDARDS



National Vocational & Technical Training Commission (NAV TTC)
Government of Pakistan



ACKNOWLEDGEMENTS

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- *Dr. Muqem ul Islam*, Director General (Skills Standards and Curricula) NAVTTTC
- *Mr. Muhammad Naeem Akhtar*, Senior Technical Advisor TSSP-GIZ,
- *Mr. Muhammad Yasir*, Deputy Director (SS&C Wing) NAVTTTC
- *Mr. Muhammad Ishaq*, Deputy Director (SS&C Wing) NAVTTTC
- *Mr. Muhammad Fayaz Soomro*, Deputy Director (SS&C Wing) NAVTTTC

NAVTTTC team under the leadership of Dr. Muqem ul Islam initiated development of CBT & A based qualifications of diploma level-5 as a reform project of TVET sector in November 2018 and completed 27 NVQF diplomas of Level-5 in September, 2019. It seems worth highlighting that during this endeavor apart from developing competency standards/curricula in conventional trades new dimensions containing high-tech trades in TVET sector in the context of generation IR 4.0 trades have also been developed which inter alia includes Robotics, Mechatronics, artificial intelligence, industrial automation, instrumentation and process control. Moreover, trades like entrepreneurship, green/environmental skills and variety of soft/digital skill have also been developed to equipped the Pakistani youth with skills set as per requirement of the global trends. These skills have been made integral part of all the 27 diplomas.

Nobody has been more important in the pursuit of this project than Dr. Nasir Khan, Executive Director, NAVTTTC, whose patronage and support remain there throughout the development process and lastly to thanks specially to Syed Javed Hassan Chairman NAVTTTC and Raja Saad Khan, Deputy Team Lead TSSP-GIZ who made it happened in this challenging time.

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1. INTRODUCTION

Since the invention of computers and machines, their capability to perform various tasks went on growing exponentially. Humans have developed the power of computer systems in terms of their diverse working domains, their increasing speed, and reducing size with respect to time. A branch of Computer Science named Artificial Intelligence (AI) pursues creating the computers or machines as intelligent as human beings.

John McCarthy defines artificial intelligence as, it is “The science and engineering of making intelligent machines, especially intelligent computer programs”. Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans thinks. AI is accomplished by studying how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

Artificial intelligence has become a powerful driving force in a wide range of industries, helping people and businesses create exciting, innovative products and services, enable more informed business decisions, and achieve key performance objectives.

The measurable objectives of this document are to develop Competency Standards (CS) in the area of AI. These CS are designed as a comprehensive training program to the study of AI for both male and female trainees at Diploma /DAE (Level-5). This training program covers basics of the subjects like introduction to AI, its principles & constituents, and its applications in a wide range of organizations etc.; entrepreneurship skills; the economic and managerial aspects of Artificial Intelligence, the historical and modern insights into the IT industry; the marketing, organizational and technological issues involved. It involves the management of multiple activities such as studying the computer intelligence, machines and relevant software. It also involves marketing efforts to attract the intelligence sharing in both entrepreneurial and industrial sector.

2. PURPOSE OF THE QUALIFICATION

The purpose of this qualification is to give training thorough understanding of artificial intelligence in IT sector as per high tech industrial trends. Artificial intelligence is a transformative technology, generally refers to the ability of digital computing devices that can imitate a wide variety of human tasks with high accuracy. Trainees will be able to be introduced with the historically significant AI systems and their underlying AI concepts. They will explore different classical and modern AI techniques, and understand the three essential ingredients that drive modern AI – machine learning, data science, big-data and algorithms using modern scientific AI techniques. Trainees will also examine the ethical and social aspects of AI technologies as well as the exciting future trends such as:

- Explain the core elements and the historical development of artificial intelligence in modern era
- Give an account of essential artificial intelligence trends
- Demonstrate an understanding of different ways to maintain artificial intelligence sharing
- Understand how products are marketed both historically and currently
- Discuss central challenges in artificial intelligence field today, such as that of the impacts of sharing ideas/intelligence images and corporate social responsibility practices for implementation
- Core challenges in artificial intelligence field today, such as the human, economic and environmental both at national and international levels.

3. DATE OF VALIDATION

These national qualifications have been validated by the Qualification Validation Committee (QVC) on 24-29 June, 2019 in Karachi and will remain valid until June, 2029.

4. DATE OF REVIEW

These national qualifications may be reviewed in September, 2023

5. CODE OF QUALIFICATION

The International Standard Classification of Education (ISCED) is a framework for assembling, compiling, and analyzing cross-nationally comparable statistics on education and training, ISCED codes for these qualifications are assigned as follow:

Qualification Titles	
National Vocational qualification Level-5 in	AI lab Assistant
National Vocational qualification Level-5 in	Assistant Database Administrator

National Vocational qualification Level-5 in AI Supervisor
National Vocational qualification Level-5 in Assistant AI Developer
National Vocational qualification Level-5 in Expert Python Developer
National Vocational qualification Level-5 in Assistant Data Analyst
National Vocational qualification Level-5 in Expert Freelancer
National Vocational qualification Level-5 in Assistant Data Scientist
National Vocational qualification Level -4 in Assistant Lab Instructor
National Vocational qualification Level -4 in Intermediate Freelancer
National Vocational qualification Level -4 in Intermediate Level Python Developer
National Vocational qualification Level -4 in Junior AI Developer
National Vocational qualification Level -4 in Junior Database Developer
National Vocational qualification Level -3 in Data Manipulator
National Vocational qualification Level -3 in Entry Level Python Developer
National Vocational qualification Level -2 in Computer Assistant
National Vocational qualification Level-2 in Data Entry Operator
National Vocational qualification Level -2 in Computer Operator

6. QUALIFICATION DEVELOPMENT COMMITTEE

The following members participated in the qualification's development workshop from 24-29 June 2019 in Karachi:

SNo.	Name & Designation	Organization
1.	Dr. Saleem Ahmed Phull Assistant Professor / Chairman Computer System Engineering	Dawood University of Engineering & Technology, Karachi
2.	Dr. Samreen Fatima Assistant Professor	Karachi University
3.	Dr. Zeeshan Ali Memon Professor / Chairman Industrial & Management Engineering	Dawood University of Engineering & Technology, Karachi
4.	Engr. Talha Tariq Lab Engineer	Dawood University of Engineering & Technology, Karachi
5.	Syed Mansoor Ahmed Assistant IT Manager	Sindh Board of Technical Education- Karachi
6.	Engr. Nimra Zeeshan Research Assistant	Dawood University of Engineering & Technology, Karachi
7.	Fayaz A. Soomro Deputy Director (Technical Education)	NAVTTTC HQs, Islamabad
8.	Muhammad Nasir Khan DACUM Facilitator	EX-DD, SS&C Wing-NAVTTTC, Islamabad

7. QUALIFICATION VALIDATION COMMITTEE

The following members participated in the qualification's validation workshop from 22-24 August 2019, in Karachi:

SNo.	Name & Designation	Organization
1.	Dr. Nouman Qadeer Assistant Professor	Mehran UET ACZAB campus Khairpur
2.	Engr. Faisal Jamal Nasir Assistant Professor	GPI Sarai Saleh, Haripur (KP-TEVTA Peshawar)
3.	Engr. Jibran Ullah Assistant Professor	GPI Takht Bhai, Mardan (KP-TEVTA Peshawar)
4.	Ehtisham ul Haq Jr. Instructor,	Mechatronics Department, GCT Taxila (P-TEVTA)
5.	Engr. Liaqat Ali Jamroo	Director Academics, (S-TEVTA, Karachi)
6.	Fyaz Ahmed Samroo Deputy Director (Technical Education)	Deputy Director Technical, (SS&C Wing, TAVTTC)
7.	Muhammad Nasir Khan DACUM Facilitator	Ex-DD (SS&C Wing, TAVTTC)

8. ENTRY REQUIREMENTS

Entry requirements of this qualification is Matric Science.

9. REGULATIONS FOR THE QUALIFICATION AND SCHEDULE OF UNITS

Not applicable

10. PACKAGING OF QUALIFICATION

The national vocational qualifications are packaged as per following:

SNo.	Code	LEVEL
LEVEL-2		
Computer Assistant/ Data Entry Operator		
1.	0619I&CT-01	Apply Structured Computer Programming
2.	0619I&CT-02	Demonstrate Mathematics-I (Calculus and Analytical Geometry)
3.	0619I&CT-03	Demonstrate Artificial Intelligence Fundamentals and Methodology
4.	0619I&CT-04	Demonstrate Data Science Fundamentals and Methodology
5.	0619I&CT-12	Utilize Libraries in Python
LEVEL-3		
Data Manipulator/Entry Level Python Developer		
6.	0619I&CT-05	Demonstrate Mathematics-II (Probability & Statistics)
7.	0619I&CT-06	Demonstrate Mathematics-III (Linear Algebra)
8.	0619I&CT-07	Apply Object Oriented Programming
9.	0619I&CT-13	Apply Data Structure & Algorithms
10.	0619I&CT-08	Utilize Database System
11.	0619I&CT-09	Perform Data Preprocessing in Python
12.	0619I&CT-10	Perform Data Handling in Python
LEVEL-4		
Assistant Lab Instructor/ Junior AI Developer / Intermediate Freelancer/ Intermediate Level Python Developer / Junior Database Developer		
13.	0619I&CT-11	Visualize and Explore Data
14.	0619I&CT-14	Use Python as Mathematics Tool
15.	0619I&CT-15	Develop Concepts on Machine Learning -I (Supervised)
16.	0619I&CT-16	Develop Concepts on Machine Learning -II (Unsupervised)
17.	0619I&CT-17	Develop Concepts on Machine Learning -III (Deep Learning)
18.	0619I&CT-18	Implement Artificial Neural Network
19.	0619I&CT-19	Implement Feed Forward Neural Network
20.	0619I&CT-20	Implement Back Propagation Training Algorithm

LEVEL-5

AI lab Assistant/ Assistant Database Administrator/ Artificial Intelligence Supervisor/ Expert Python Developer/ Assistant Data Analyst/ Expert Freelancer/ Assistant Data Scientist

21.	0619I&CT-21	Implement K Means Clustering Algorithm
22.	0619I&CT-22	Implement Convolutional Neural Network
23.	0619I&CT-23	Implement Natural Language Processing
24.	0619I&CT-24	Implement Text Analytics
25.	0619I&CT-25	Develop Object Detection system
26.	0619I&CT-26	Develop Character Recognition System
27.	0619I&CT-27	Develop Fraud Detection System
28.	0619I&CT-28	Develop Forecasting for Stock Market
29.	0619I&CT-29	Develop Chat bot
30.	0619I&CT-30	Develop Self Driving Vehicle

11.OCCUPATIONS OF ARTIFICIAL INTELLIGENCE

SNo.	Name of Occupation/ Nomenclature	Level	Digital Skills require	Soft Skills require	Entrepreneurship	Technical Skills required
1.	Assistant Database Administrator	5			1, 3, 4, 5, 6,7, 8	21,22,23,24,25, 26,27,28,29,30, 31, 32,33
2.	Artificial Intelligence Supervisor	5			1, 3, 4, 5, 6,7, 8	21,22,23,24,25, 26,27,28,29,30, 31, 32,33
3.	Expert Python Developer	5			1, 3, 4, 5, 6,7, 8	21,22,23,24,25, 26,27,28,29,30, 31, 32,33
4.	Assistant Data Analyst	5			1, 3, 4, 5, 6,7, 8	21,22,23,24,25, 26,27,28,29,30, 31, 32,33
5.	Expert Freelancer	5			1, 3, 4, 5, 6,7, 8	21,22,23,24,25, 26,27,28,29,30, 31, 32,33
6.	Assistant Data Scientist	5			1, 3, 4, 5, 6,7, 8	21,22,23,24,25, 26,27,28,29,30, 31, 32,33
7.	AI lab Assistant	5			1, 3, 4, 5, 6,7, 8	21,22,23,24,25, 26,27,28,29,30, 31, 32,33
8.	Assistant Lab Instructor	4	2, 5, 7, 8, 9,	1, 2, 4, 5, 7		13,14,15,16,17,18,19,20
9.	Junior AI Developer	4	2, 5, 7, 8, 9,	1, 2, 4, 5, 7		13,14,15,16,17,18,19,20
10.	Intermediate Freelancer	4	2, 5, 7, 8, 9,	1, 2, 4, 5, 7		13,14,15,16,17,18,19,20
11.	Intermediate Level Python Developer	4	2, 5, 7, 8, 9,	1, 2, 4, 5, 7		13,14,15,16,17,18,19,20
12.	Junior Database Developer	4	2, 5, 7, 8, 9,	1, 2, 4, 5, 7		13,14,15,16,17,18,19,20
13.	Data Manipulator	3	4,6	3, 6	2	6,7,8,9,10,11,12

14.	Entry Level Python Developer	3	4,6	3, 6	2	6,7,8,9,10,11,12
15.	Computer Assistant	2	1, 3, 10, 11, 12	8	10,11,12	1,2,3,4,5
16.	Computer Operator	2	1, 3, 10, 11, 12	8	10,11,12	1,2,3,4,5
17.	Data Entry Operator	2	1, 3, 10, 11, 12	8	10,11,12	1,2,3,4,5

12. SUMMARY OF COMPETENCY STANDARDS

Code	Competency Standards	Level	Contact Hours			Category
			Theory	Practical	Total	
Level-2						
1.	Perform Basics Computer Operations		1	3	4	Generic
2.	Use Operating System and Computer Hardware					Generic
3.	Use Word Processor		2	3	5	Generic
4.	Operate Presentation Packages		1	3	4	Generic
5.	Use Spread Sheet application		1	6	7	Generic
6.	Maintain professionalism in the workplace		1	3	4	Generic
7.	Apply Structured Computer Programming		40	50	90	Technical
8.	Demonstrate Mathematics-I (Calculus and Analytical Geometry)		30	30	60	Technical
9.	Demonstrate Artificial Intelligence Fundamentals and Methodology		40	50	90	Technical
10.	Demonstrate Data Science Fundamentals and Methodology		30	50	80	Technical
11.	Utilize Libraries in Python		30	30	60	Technical
Total			240	350	590	
Level-3						
1.	Create User Documentation		2	6	8	Generic
2.	Use social media tools for collaboration and engagement		2	6	8	Generic
3.	Perform writing and editing tasks		2	6	8	Generic
4.	Work safely in an office environment		2	3	5	Generic
5.	Undertake Project Work		3	9	12	Generic
6.	Apply project information management and communications techniques		3	3	6	Generic
7.	Demonstrate Mathematics-II (Probability & Statistics)		40	40	80	Technical
8.	Demonstrate Mathematics-III (Linear		40	40	80	Technical

	Algebra)					
9.	Apply Object Oriented Programming		50	60	110	Technical
10.	Apply Data Structure & Algorithms		40	50	90	Technical
11.	Perform Data Preprocessing in Python		20	50	70	Technical
12.	Perform Data Handling in Python		20	30	50	Technical
13.	Utilize Database System		30	30	60	Technical
Total						
Level-4						
1.	Create technical documentation		2	6	8	Generic
2.	E-Commerce- SEO (Search Engine Optimization)		3	3	6	Generic
3.	E-Commerce- SCM (Supply Chain Management)		2	6	8	Generic
4.	E-Commerce- Social Media Marketing		2	6	8	Generic
5.	Operate digital media technology		1	6	7	Generic
6.	Manage meetings		2	3	5	Generic
7.	Manage workforce planning		2	6	8	Generic
8.	Identify and communicate trends in career development		2	3	5	Generic
9.	Apply specialist interpersonal and counseling interview skills		1	3	4	Generic
10.	Develop workplace documents		2	6	8	Generic
11.	Visualize and Explore Data		20	30	50	Technical
12.	Implement Artificial Neural Network		30	50	80	Technical
13.	Implement Feed Forward Neural Network		30	50	80	Technical
14.	Use Python as Mathematics Tool		30	30	60	Technical
15.	Develop Concepts on Machine Learning -I (Supervised)		40	50	90	Technical
16.	Develop Concepts on Machine Learning -II (Unsupervised)		30	40	70	Technical
17.	Develop Concepts on Machine Learning -III (Deep Learning)		20	30	50	Technical
18.	Implement Back Propagation		30	40	70	Technical

	Training Algorithm					
Total						
Level-5						
1.	Develop Entrepreneurial Skills		2	3	5	Generic
2.	Apply project human resources management approaches		3	6	9	Generic
3.	Develop a project management plan		3	6	9	Generic
4.	Develop a sales plan		3	6	9	Generic
5.	Address customer needs		3	3	6	Generic
6.	Manage personal finances		2	3	5	Generic
7.	Solve problems which jeopardize safety and security		2	3	5	Generic
8.	Implement K Means Clustering Algorithm		20	30	50	Technical
9.	Implement Convolutional Neural Network		20	30	50	Technical
10.	Implement Natural Language Processing		20	30	50	Technical
11.	Implement Text Analytics		20	30	50	Technical
12.	Develop Object Detection system		20	30	50	Technical
13.	Develop Character Recognition System		20	30	50	Technical
14.	Develop Fraud Detection System		30	30	60	Technical
15.	Develop Forecasting for Stock Market		20	30	50	Technical
16.	Develop Chat bot		30	30	60	Technical
17.	Develop Self Driving Vehicle		30	50	80	Technical
Total						

0619I&CT01.Apply Structured Computer Programming

Overview:

This competency standard covers the skills and knowledge required to develop how to write a computer program. It will create the knowledge to write lists of instructions for a computer to follow and to develop the software programs, the scripts, or other sets of instructions for the computers to execute. This unit will cover the knowledge of programming language Python which has variety of data types and powerful operators. Due to this, students will be able to write computer programs efficiently and easily.

Competency Units	Performance Criterion
CU-1. Setup Python on Windows	P1: Download python installer P2: Run the Installer P3: Complete the installation process as per instruction P4: Download python IDLE P5: Complete the installation process as per instruction P6: Identify interpreter vs script mode
CU-2. Develop a computer program (simple)	P1: Analyze a given problem P2: Open the IDLE for coding P3: Code a simple program P4: Save a program file with .py extension P5: Compile a code P6: Debug the code (in case of error) P7: Run a code
CU-3. Execute Python Syntax	P1: Identify Python Variables P2: Identify the python keywords P3: Identify the python datatypes P4: Identify the numeric types in python P5: Specify a Python Variable Type P6: Identify the Indentations and Whitespace P7: Implement python Boolean P8: Implement Python operators
CU-4. String Handling in python	P1: Identify the python strings P2: Display the string with print function

	<p>P3: Assign String to a Variable</p> <p>P4: Assign multiline string to a variable</p> <p>P5: Get character position of string as array</p> <p>P6: Slicing the string</p> <p>P7: Negative indexing on string</p> <p>P8: Determine string length</p> <p>P9: Use string methods</p> <p>P10: Check the phrase and character in the string</p> <p>P11: String concatenation</p> <p>P12: Use Format () method</p> <p>P13: Implement escape character</p>
<p>CU-5. Develop a program based on control structures IF statement</p>	<p>P1: Identify the different logical conditions</p> <p>P2: Identify the different logical operators</p> <p>P3: Identify the Short Hand If and If else</p> <p>P4: Initialize two variables, a and b</p> <p>P5: Assign a value to variable</p> <p>P6: Check if whether b is greater than a</p> <p>P7: Print the statement if the condition is true</p>
<p>CU-6. Develop a program based on control structures ELIF statement</p>	<p>P1: Initialize two variables, a and b</p> <p>P2: Assign a value to variable</p> <p>P3: Check if whether a is greater than b with IF statement</p> <p>P4: Check condition that if a is greater than b for ELIF statement</p> <p>P5: Print the statement which is true.</p>
<p>CU-7. Develop a program based on control structures IF_ELSE statement</p>	<p>P1: Initialize two variables, a and b</p> <p>P2: Assign a value to variable</p> <p>P3: Check if a is greater than b with IF statement</p> <p>P4: If condition is not true print the statement under the Else statement</p> <p>P5: Implement Nested if else statement</p> <p>P6: Use a pass statement</p>
<p>CU-8. Develop program using List</p>	<p>P1: Declaration of list</p> <p>P2: Access list elements</p> <p>P3: Use of negative indexing</p> <p>P4: Specify the range of indexes</p> <p>P5: Change the value of specific item in a list</p>

	<p>P6: Determine the list length</p> <p>P7: Apply different list methods</p>
<p>CU-9. Develop a program using Tuples</p>	<p>P1: Declaration of Tuples</p> <p>P2: Access tuples elements</p> <p>P3: Use of negative indexing</p> <p>P4: Specify the range of indexes</p> <p>P5: Change the value of specific item in a tuple</p> <p>P6: Apply different tuples methods and keywords</p> <p>P7: Add item to tuple</p>
<p>CU-10. Develop a program using Sets</p>	<p>P1: Declaration of Set</p> <p>P2: Access Set elements</p> <p>P3: Use of negative indexing</p> <p>P4: Specify the range of indexes</p> <p>P5: Change the value of specific item in a Set</p> <p>P6: Apply different Set methods and keywords</p>
<p>CU-11. Develop a program using dictionary</p>	<p>P7: Create and print a dictionary</p> <p>P8: Access dictionary elements</p> <p>P9: Use of negative indexing</p> <p>P10: Specify the range of indexes</p> <p>P11: Change the value of specific item in a dictionary</p> <p>P12: Apply different dictionary methods and keywords</p> <p>P13: Create a nested dictionary.</p>
<p>CU-12. Develop program using WHILE loop structure</p>	<p>P1: Initialize a variable with value in it</p> <p>P2: Declare While Keyword with count variable to condition till it execute</p> <p>P3: Print the statement whenever condition is true.</p> <p>P4: Increment the variable count until conditions get false</p> <p>P5: Use Break statement</p> <p>P6: Use the continue statement</p> <p>P7: Use While loop with else statement</p>
<p>CU-13. Develop program using FOR loop</p>	<p>P1: Declare the List</p> <p>P2: Print the items in a list</p> <p>P3: Apply looping in a through a string</p> <p>P4: Use break statement in a For loop</p> <p>P5: Use the continue statement</p> <p>P6: Use the range () function</p>

	<p>P7: Use For loop with else statement</p> <p>P8: Apply nested loop</p> <p>P9: Use Pass statement</p>
<p>CU-14. Develop program using functions</p>	<p>P1: Create function</p> <p>P2: Use of function call</p> <p>P3: Identify the types of functions</p> <p>P4: Passing values/list in a function</p> <p>P5: Use the Return statement in function</p> <p>P6: Use default parameter values</p> <p>P7: Send keyword arguments</p> <p>P8: Use of arbitrary arguments</p> <p>P9: Use of the pass statement</p> <p>P10: Implement recursion in a function</p> <p>P11: Implement Lambda function</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Describe the basic programming concept
- K2:** Define python IDE
- K3:** Define basics of python language
- K4:** Types of operators in python
- K5:** Types of Arrays in Pythons
- K6:** Define Data Types, Variables, Constants and Variables.
- K7:** Define basic input and output statements.
- K8:** performing debugging of a code
- K9:** Understanding of two-dimensional arrays
- K10:** Define IF statement
- K11:** Define IF ELSE statement
- K12:** Define ELIF statement
- K13:** Understand loop structure
- K14:** Define FOR loop
- K15:** Define WHILE loop
- K16:** Define DO-WHILE loop
- K17:** Define nested loop
- K18:** Define functions

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Develop program using loops
2. Develop program using functions
3. Develop a program using operators and conditional statement
4. Develop a program using dictionaries.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1.	Computer System
2.	Operating System Software
3.	Python Shell
4.	Internet Connection

0619I&CT02.Demonstrate Mathematics-I (Calculus and Analytical Geometry)

Overview:

This is an introductory course in Mathematics-I designed to introduce students to its applications that are relevant in Artificial Intelligence. The content of this course includes Limits, Differential, Integral and Analytic Geometry.

Competency Units	Performance Criterion
CU-1. Identify Mathematical Model	P1: Identify function P2: Identity types of function P3: Identify the variable in function
CU-2. Identify Limits	P1: Learn and apply limits and continuity P2: Calculate limits P3: Identify the techniques of finding limits P4: Identify indeterminate forms of limits P5: Identify the concepts continuous and discontinuous functions and their applications
CU-3. Identify the Differentiation	P1: Identify the concepts of differentiation P2: Identify and apply geometrical and physical meaning of derivatives P3: Identify rules of differentiation, techniques of differentiation P4: Identify and calculate differentiation, rates of change P5: Identify and calculate tangents and normal lines P6: Identify and apply chain rule P7: Identify and calculate differentiation P8: Identify and calculate linear approximation P9: Identify and apply applications of differentiation: extreme value functions, mean value theorems, maxima and minima of a function for single-variable, concavity
CU-4. Identify the Integral calculus	P1: Identify the basic concepts of Integration P2: Identify and calculate Indefinite Integrals P3: Identify the techniques of integration P4: Identify and calculate Riemann sums and Definite Integrals P5: Identify and calculate Applications of definite integrals P6: Identify and calculate Improper integral P7: Identify and apply Integration

	P8: Identify Area under the curve
CU-5. Identify Analytical Geometry	P1: Identify and understand the Straight lines in three dimensions P2: Identify and understand the equations for planes

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Understand the basic mathematical model
- K2:** Estimate the measures of central tendency for the data.
- K3:** Understand the concept of differentiation.
- K4:** Understand different techniques of differentiation.
- K5:** Demonstrate the ability to determine application of differentiation.
- K6:** Understand the concept of Integration.
- K7:** Understand different techniques of Integration.
- K8:** Demonstrate the ability to determine application of Integration.
- K9:** Understand the concept of Analytical Geometry.

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform Exercise of finding Limits.
2. Demonstrate the application of differentiation and Integration
3. Calculate area under the curve

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1.	Notebook
2.	Pen
3.	Scientific Calculator

0619I&CT03.Demonstrate Artificial Intelligence Fundamentals and Methodology -

Overview:

This module introduces fundamentals and methodology of artificial intelligence. It will make student to learn the fundamentals and methodology of artificial intelligence.

Competency Units	Performance Criterion
CU-1. Identify the Foundation of AI	<p>P1. Draw the map showing history of AI. P2. Draw the biological concept of neuron P3. Draw the basic diagram of the perceptron P4. Draw the Flow chart showing the type of Artificial Intelligence, Reactive machines, Limited memory, Theory of mind, Self-awareness. P5. Explain the steps of the of Turing Test P6. Draw the components of intelligence,</p>
CU-2. Identify the Approaches of AI	<p>P1. Demonstrate with example the Statistical Approach in AI P2. Demonstrate with example of Cybernetics & Brain Simulation Approach in AI P3. Demonstrate with example of Symbolic Approach in AI P4. Demonstrate with example of Cognitive Simulation Approach in AI</p>
CU-3. Identify Tools for AI	<p>P1: Draw the Machine learning Process Diagram. P2: Explain the purpose of Microsoft Azure Machine Learning P3: Explain the purpose of Google Cloud Prediction API P4: Recognize the tool for website machine learning framework P5: Recognize the tools for Mobile App Development Framework</p>
CU-4. Identify the Deduction, Reasoning and problem Solving in AI	<p>P1: Demonstrate deduction method in AI P2: Draw a structure Reasoning and Problem Solving in AI P3: Demonstrate Search and Optimization in AI P4: Draw the Knowledge representation in AI P5: Draw the working model of Each Types of Agents and environment in Artificial Intelligence</p>
CU-5. Identify the AI Goals	<p>P6: Demonstrate Single Agent Pathfinding Problems P7: Draw the algorithm for Breadth-First Search P8: Draw the algorithm for Depth-First Search P9: Draw the algorithm for A * Search P10: Draw the algorithm for Greedy Best First Search</p>

	<p>P11: Draw the algorithm for Draw the Algorithm of Fuzzy Logic System</p> <p>P12: Draw Process the Natural Language Processing in AI</p>
<p>CU-6. Identify the Artificial Intelligence Areas</p>	<p>P1: Draw the working strategy of the Machine Learning</p> <p>P2: Draw the working strategy Reinforcement Learning</p> <p>P3: Draw the working strategy the Computer Vision</p> <p>P4: Draw the working strategy the Natural Language Processing</p> <p>P5: Draw the working strategy the Recommender System</p> <p>P6: Draw the workflow of Internet of Things</p>
<p>CU-7. Identify the Real-World Applications of AI</p>	<p>P1: Draw the charts showing how AI helped in goods management</p> <p>P2: Draw the charts showing how AI helped in Aviation</p> <p>P3: Draw the charts showing how AI helped in for Education</p> <p>P4: Draw the charts showing how AI helped in Healthcare</p> <p>P5: Draw the charts showing how AI helped in Heavy Industry</p> <p>P6: Draw the charts showing how AI helped in of Finance Sector</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understand the term Artificial Intelligence

K2: Understand the history of AI

K3: Understand biological concept of neuron

K4: Identify the perceptron

K5: Classify the Intelligence types, Naturalist, Musical, Logical-mathematical, Existential, Interpersonal, Bodily-kinesthetic, Linguistic, Intra-personal, Spatial.

K6: Recognize the type of Artificial Intelligence, Reactive machines, Limited memory, Theory of mind, Self-awareness.

K7: Understand the concept of Turing Test

K8: Identify the Statistical Approach in AI

K9: Identify the Cybernetics & Brain Simulation Approach in AI

K10: Identify the Symbolic Approach in AI

K11: Identify the Cognitive Simulation Approach in AI

K12: Discuss the Libraries of AI

K13: Discuss Microsoft Azure Machine Learning

- K14:** Discuss Google Cloud Prediction API
- K15:** Recognize the tool for website machine learning framework
- K16:** Recognize the tools for Mobile App Development Framework
- K17:** Learn the deduction method in AI
- K18:** Learn the Reasoning and Problem Solving in AI
- K19:** Learn the Search and Optimization in AI
- K20:** Learn the Knowledge representation in AI
- K21:** Learn the Planning in AI
- K22:** Learn the Learning in AI
- K23:** Learn the Natural Language Processing in AI
- K24:** Learn the Perception concept
- K25:** Learn the Motion and Manipulation
- K26:** Learn the concept of Social Intelligence
- K27:** Identify the Machine Learning
- K28:** Identify the Deep Learning
- K29:** Identify the Reinforcement
- K30:** Apply the Robotics
- K31:** Identify the Computer Vision
- K32:** Identify the Natural Language Processing
- K33:** Identify the Recommender System
- K34:** Identify the Algorithm Game theory and Computation Mechanism Design
- K35:** Learn Internet of Things
- K36:** Recognize AI vs ML vs DL
- K37:** Recognize Conventional Programming Methods and AI
- K38:** Identify the application of Goods
- K39:** Identify the application of Aviation
- K40:** Identify the application of AI for Education
- K41:** Identify the application of Healthcare
- K42:** Identify the application of Heavy Industry
- K43:** Identify the application of Finance Sector

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Identify the tools for AI
2. Differentiate between AI vs ML vs DL
3. List down the major application of AI

Tools & Equipment required:

SNo.	DESCRIPTION
1	Notebook
2	Pencil/Pen
3	Computer System

0619I&CT04.Demonstrate Data science Fundamentals and Methodology

Overview:

This introduce fundamentals of data science will make student to learn and the introduce fundamentals of data science using python.

Competency Units	Performance Criterion
CU-1. Identify basic Data Science operation	P1: Apply Data Science in AI P2: Identify the types of Data Scientist P3: Identify what kind of problem can be solve in Data Science P4: Identify Data Architecture P5: Identify Data Analytics
CU-2. Identify the tools for data science	P1: Identify Data Wrangling P2: Concept of Acquiring data from different Source P3: Structured, Semi-Structured and Unstructured Data P4: Identify the Common data formats of Data Science P5: Identify the Use of Statistical analysis, and data visualization P6: Identify the use of Excel sheet for data analysis P7: Identify the Hadoop platform for big data application P8: Identify the Extraction and preparation of dataset P9: Identify Feature Selection P10: Identify parallel processing
CU-3. Identify Applications and areas of Data science	P1: Identify Data Science for Health Care P2: Demonstrate use of data science in Sports P3: Demonstrate use of data science in Amazon P4: Demonstrate use of data science in Netflix P5: Demonstrate use of data science in Market analysis
CU-4. Classify Characteristics of Data Science	P1: Understand the three V's of Data science P2: Identify the term "Volume" P3: Identify the term "Velocity" P4: Identify the term "Variety"
CU-5. Identify Challenges of Data Science	P1: Identify the concept of Data Acquisition P2: Identify the concept of Informed Search and Analytics P3: Identify the concept of High Volume of Data P4: Identify the concept of High Velocity of Processed Data

	<p>P5: Identify the concept of Information Storage and Analytics</p> <p>P6: Identify the concept of Data Security and Privacy</p> <p>P7: Identify the concept of High variety of information</p> <p>P8: Identify the concept of High veracity of Data</p> <p>P9: Identify the ethics to handle data</p>
CU-6. Identify Domains of Data Science	<p>P1: Identify need of Statistic in Data Science</p> <p>P2: Identify need of Data Engineering</p> <p>P3: Identify need of Visualization</p> <p>P4: Identify need of Advance Computing</p>
CU-7. Process flow of Data Science	<p>P1: Identify problem statement</p> <p>P2: Identify the Machine Learning Algorithm to be used</p> <p>P3: Identify the implementation of algorithm in dataset</p> <p>P4: Identify the implementation of machine learning in Hadoop</p> <p>P5: Identify the ways to integrate Hadoop</p> <p>P6: Identify the visualization of analysis</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understand basic terminologies of data science

K2: Understand concept of Machine Learning

K3: Understand concept of Data Analytics

K4: Understand and learn the tools use for data science

K5: Understand learn use of database

K6: Understand the challenges for data science

K7: Understand and learn the areas and applications of data science

K8: Learn and understand the characteristic of data science

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Explain the tools of Data science
2. Explain the components of data science
3. Draw the process flow of data in data science

Tools & Equipment required:

SNo.	DESCRIPTION
1	Paper
2	Pencil/Pen

0619I&CT05.Demonstrate Mathematics-II (Probability & Statistics) concepts

Overview:

This is an introductory course in probability and statistics designed to introduce students to its applications that are relevant in a variety of discipline including Engineering and Computer science etc. The content of this course includes Descriptive Statistics, set theory review, Axioms of Probability, Addition Multiplication Laws of Probability, Independence, Conditional Probability, Law of total probability, Bayes' Rule, Random variables, some special discrete and continuous probability distributions, Expected Values, Joint distribution, Marginal distribution etc.

Competency Units	Performance Criterion
CU-1. Apply basics of Statistics	P1: Perform basic operations of Statistics P2: Apply Descriptive Statistics P3: Apply Inferential Statistics P4: Construct Frequency distribution P5: Construct Histogram P6: Plot frequency curves
CU-2. Measure the Central Tendency & Dispersion	P1: Calculate mean on given data P2: Calculate median on given data P3: Calculate mode of data P4: Calculate quantiles of data set P5: Calculate variance in data P6: Calculate the skew P7: Calculate kurtosis
CU-3. Apply Probability in AI	P1: Apply the basic concept of Probability P2: Apply basic Rules of probability in AI P3: Develop the Venn Diagram of Probabilities P4: Apply Axioms of Probability P5: Calculate the Conditional probability P6: Apply Bayes' theorem to find probability
CU-4. Use Random variables in AI	P1: Apply Discrete random variables P2: Apply Continuous random variables P3: Apply Probability Mass Function P4: Apply Distribution Functions of the variables

	P5: Apply Expected Value of Random Variables P6: Apply Variance of Random Variables
CU-5. Apply Discrete Probability Distribution	P1: Apply Discrete Random variable in AI P2: Apply Binomial theorem in AI P3: Apply Poisson theorem P4: Apply Negative P5: Apply Geometric mean
CU-6. Apply Continuous probability distribution	P1: Apply basic Continuous Random distribution in AI P2: Apply the Normal distribution P3: Apply the Standard normal P4: Apply Exponential distribution on given data
CU-7. Apply Regression and correlation	P1: Apply Simple Regression function P2: Apply the Parameter estimation method using least square method P3: Calculate Correlation P4: Calculate Multiple correlation

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Numerical and graphical estimate of data

K2: Central tendency for data.

K3: Dispersion for the data.

K4: Moments of the distributions.

K5: Interpretation of basic concepts of the probability with applications.

K6: Random variables.

K7: Discrete and continuous random variables

K8: Types of data computing numerical techniques

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Find analytically the behavior of the distributions.
2. Estimate the expected value and standard deviation of random variables.
3. Use concepts of moments generating functions for random variables.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1.	Paper
2.	Pen
3.	Calculator

0619I&CT06.Demonstrate Mathematics-III (Linear Algebra) concepts

Overview:

In this module student will be able to understand and apply vectors, perform matrices operations, and perform linear transformation

Competency Units	Performance Criterion
CU-1. Apply Vectors	<p>P1: Draw vectors</p> <p>P2: Apply Vector Operations</p> <p>P3: Apply Linear Combinations</p> <p>P4: Apply Linear Independence</p> <p>P5: Apply Linear Dependence</p> <p>P6: Calculate vector Bases</p> <p>P7: Calculate vector Dimension</p>
CU-2. Perform Matrices operations	<p>P1: Perform simple Matrix Operations</p> <p>P2: Perform Matrix Multiplication</p> <p>P3: Calculate Matrix Inverses and Systems of Linear Equations</p> <p>P4: Calculate Matrix Inverses and Nonsingular Matrices</p> <p>P5: Calculate Determinant of a Matrix</p> <p>P6: Calculate Properties of Determinants of Matrices</p> <p>P7: Calculate the Positive Definite of matrix</p>
CU-3. Perform Linear transformation	<p>P1: Calculate Eigenvalues of matrices</p> <p>P2: Calculate Eigenvectors</p> <p>P3: Calculate Similarity and Diagonal</p> <p>P4: Calculate Inner products of vectors.</p> <p>P5: Apply Orthogonality and least squares</p> <p>P6: Apply Linear Transformation systems for AI</p> <p>P7: Apply Singular Value Decomposition</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Understand the concept of Vectors.
- K2:** Learn and understand the concept of Matrices.
- K3:** Understand Linear transformation

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Calculate vector addition
2. Calculate vector subtraction
3. Find dimension of a given vector
4. Find vector bases
5. Find orthogonal of a vector
6. Calculate Eigenvalues
7. Calculate Eigenvectors
8. Apply Singular Value Decomposition
9. Tools & Equipment required:

SNo.	DESCRIPTION
1.	Paper
2.	Pen
3.	Calculator

0619I&CT07.Apply Object Oriented: Program

Overview

This competency standard covers the knowledge and skills on how to design python Classes, and how to implement object-oriented concepts in python. Other concepts cover are Object, Inheritance, Polymorphism and Encapsulation. It also deals with the functionalities of interface generics and exceptional handling techniques.

Competency Units	Performance Criterion
CU-1. Apply Python Setup on Windows	P1: Download python installer P2: Run the Installer P3: Download python IDE P4: Identify interpreter vs script mode
CU-2. Develop object-oriented program	P1: Create classes P2: Create constructors P3: Create methods P4: Use classes, instances, attributes, and methods P5: Use Constructors and Destructor P6: Debug the code (in case of error) P7: Run a code
CU-3. Develop a program using advance concepts of OOPS	P1: Use inheritance P2: Use virtual functions P3: Explore multiple inheritance P4: Implement polymorphism P5: Use encapsulation P6: Perform exception handling

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:**Define object-oriented programming (OOP).
- K2:** Define the characteristics of OOP
- K3:** Differentiate between object and class
- K4:** Define a class
- K5:** Describe how to create class
- K6:** Define object

- K7:** Describe how to do object instantiation
- K8:** Define Constructors and Destructors by using programming examples
- K9:** Define operator overloading using different operators.
- K10:** Define access specifiers
- K11:** Define Inheritance
- K12:** Define types of inheritance
- K13:** Define polymorphism
- K14:** Define exception handling

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Write a program using classes, objects and inheritance

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer System
2	IDE
3	Python

0619I&CT08.Utilize Database System

Overview:

This competency standard covers the general overview of databases, introducing you to database history, modern database systems, the different models used to design a database, and Structured Query Language (SQL), which is the standard language used to access and manipulate databases.

Competency Units	Performance Criterion
CU-1. Identify database systems	<p>P1: Identify the role of databases in organization</p> <p>P2: Gain basic concepts of databases</p> <p>P3: Compare database approach vs file-based system</p>
CU-2. Introduce database system concept and architecture	<p>P1: Apply database models, schemas and instances.</p> <p>P2: Use three schema architecture and data independence</p> <p>P3: Apply database languages and interfaces.</p> <p>P4: Explore centralized and client/server architecture for DBMSs</p> <p>P5: Classify database management systems</p> <p>P6:</p>
CU-3. Apply basic SQL	<p>P1: Apply relational model</p> <p>P2: Work on SQL data definition and data types</p> <p>P3: Perform basic retrieval queries in SQL.</p> <p>P4: Use INSERT, UPDATE and DELETE queries in SQL</p>
CU-4. Perform data modeling using the Entity-Relationship (ER) model	<p>P1: Use attributes, keys, Entity, tuples, domains, relation instances.</p> <p>P2: Explore relationship types, relationship sets, roles, and structural constraints.</p> <p>P3: Use weak entity types</p> <p>P4: Refine the ER design for the COMPANY database</p> <p>P5: Develop ER diagrams</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Learn basic database concepts

K2: Learn about databases history

- K3:** Learn about file-based system
- K4:** Learn and understand about database architecture
- K5:** Learn about database models
- K6:** Learn about schemas and instances
- K7:** Understand three schema architecture
- K8:** Learn about data independence
- K9:** Understand database languages
- K10:** Understand centralized and client/server architecture for database management system
- K11:** Learn relational data model
- K12:** Learn SQL data definition and data types
- K13:** Learn about basic retrieval queries in SQL
- K14:** Learn about INSERT, UPDATE and DELETE queries
- K15:** Learn about attributes, keys, Entity, tuples, domains, relation instances
- K16:** Learn about relationship types, relationship sets, roles, and structural constraints.
- K17:** Learn about weak entity types
- K18:** Learn about ER diagram

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Design a database performing addition, update and delete operation.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	SQL software package

0619I&CT09.Perform Data Preprocessing in Python

Overview:

This competency standard covers formatting of data before process using different techniques and libraries in python so the execution of algorithm will be more efficient and more algorithms can be executed in one dataset.

Competency Units	Performance Criterion
CU-1. Apply Data Preprocessing	<p>P6: Deal with missing data</p> <p>P7: Deal with categorical data</p> <p>P8: Split the dataset into training and testing sets</p> <p>P9: Scale the features</p>
CU-2. Perform Rescaling of Data	<p>P1: Apply rescale data techniques</p> <p>P2: Import Libraries i.e. pandas, SciPy and NumPy</p> <p>P3: Import Mixmaxscaler from sklearn preprocessing class</p> <p>P4: Import Dataset</p> <p>P5: Call values with data frame method of pandas</p> <p>P6: Separate the data array into Input and output components</p> <p>P7: Determine the feature_range of data</p> <p>P8: Rescale data by using fit_transform method</p> <p>P9: Summarize the transformed data</p> <p>P10: Run the code</p> <p>P11: Analyze the result</p> <p>P12: Use data rescaling in different algorithms.</p>
CU-3. Binarize the Data	<p>P1: Apply Binarize Data techniques</p> <p>P2: Import Libraries that is pandas and Numpy</p> <p>P3: Import Binarizer from sklearn preprocessing class</p> <p>P4: Import Dataset</p> <p>P5: Call values with data frame method of pandas</p> <p>P6: Separate the data array into Input and output components</p> <p>P7: Determine the feature range of data</p> <p>P8: Binarize data by directing threshold limit</p> <p>P9: Fit method to set the threshold on data</p> <p>P10: Apply transform on Binarize data</p> <p>P11: Summarize the transformed data</p>

	<p>P12: Run the code</p> <p>P13: Analyze the result</p> <p>P14: Use data binarizing in different algorithms</p>
CU-4. Standardize Data	<p>P1: Implement the Binarize Data techniques</p> <p>P2: Import Libraries that is pandas and Numpy</p> <p>P3: Import standardscaler from sklearn preprocessing class</p> <p>P4: Import Dataset</p> <p>P5: Call values with data frame method of pandas</p> <p>P6: Separate the data array into Input and output components</p> <p>P7: Determine the feature range of data</p> <p>P8: Standardize the data by using standardscaler Method</p> <p>P9: Call Fit method to set the values</p> <p>P10: Apply transform on Standardized Data</p> <p>P11: Summarize the transformed data</p> <p>P12: Run the code</p> <p>P13: Analyze the result</p> <p>P14: Use data Standardizing in different algorithms</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Understand and Learn Basic programming knowledge in python
- K2:** Understand and Learn Types of Dataset and how to import them.
- K3:** Understand and Learn Classification of independent and dependent variables
- K4:** Understand and Learn Dealing with missing data
- K5:** Understand and Learn Dealing with categorical data
- K6:** Understand and Learn Understand and Learn Splitting of data set into training and testing
- K7:** Understand and Learn Understand Scaling of features

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Rescale data, program the rescaling of data using skit-learn class.
2. Perform data binarizing

3. Perform data standardizing

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer System
2	Python IDE

0619I&CT10.Perform Data Handling in Python

Overview:

This competency standard covers Integration of data, cleaning of data, data transformation before process using different techniques and libraries in python so the execution of algorithm will be more efficient and more algorithms can be executed in one dataset.

Competency Units	Performance Criterion
CU-1. Perform Data Integration	<p>P1: Put different format data from various sources into a uniform shape</p> <p>P2: Merge data with defined homogenize data-flow</p> <p>P3: Perform tight coupling of data</p> <p>P4: Perform loose coupling of data</p>
CU-2. Perform Data Cleaning	<p>P1: Recognize the different techniques for cleaning</p> <p>P2: Identify outliers and smooth out noisy instances</p> <p>P3: Drop Columns in a Data Frame</p> <p>P4: Change the Index of a Data Frame</p> <p>P5: Tide up Fields in the Data</p> <p>P6: Combine str Methods with NumPy to Clean Columns</p> <p>P7: Clean the Entire Dataset Using the apply map Function</p> <p>P8: Rename Columns and apply Skipping Rows</p>
CU-3. Perform Data Transformation	<p>P1: Perform data discovery where you identify the sources and data types.</p> <p>P2: Determine the structure and data transformations that need to occur.</p> <p>P3: Perform data mapping to define how individual fields are mapped, modified, joined, filtered, and aggregated.</p> <p>P4: Perform Data Binning or Bucketing</p> <p>P5: Convert categorical data into Boolean values</p> <p>P6: Apply Centering and scaling data techniques</p> <p>P7: Perform Grouping on data</p>
CU-4. Perform Data Discretization	<p>P1: Apply data Discretization Strategies</p> <p>P2: Discretize data by binning</p> <p>P3: Discretize data by Histogram analysis</p> <p>P4: Discretize data by decision tree and correlation</p>

	P5: Perform hierarchy Generation for Normal data
CU-5. Perform Data Reduction	P1: Apply the techniques of data reduction P2: Apply the concept of wavelet transforms P3: Apply the principle components of analysis P4: Apply the concept of parametric data reduction P5: Apply the concept of histogram P6: Apply the concept of sampling P7: Apply the concept of data aggregation

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Understand the concept of Data Integration
- K2:** Understand the concept of Data Cleaning
- K3:** Understand the concept of Understand the concept of Data Reduction
- K4:** Transformation
- K5:** Understand the concept of Discretization

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Put different format data from various sources into a uniform shape
2. Perform different techniques to clean the noise from data
3. Construct histogram

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python IDE

0619I&CT11. Visualize and Explore Data

Overview:

This competency standard covers loading of data set, convert variable into different data types and exploratory analysis using pandas and plot different graphs.

Competency Units	Performance Criterion
CU-1. Load Data set	P1: Import library P2: Call the pandas read method and access the path of file P3: Read data in data frames using pandas P4: Print the observations P5: Execute the Program P6: Load the files of different format
CU-2. Convert a variable to different data type	P7: Convert numeric variables to string variables and vice versa P8: Convert character date to Date:
CU-3. Perform Exploratory analysis in Python using Pandas	P1: Use series and Data frames P2: Import libraries and the data set: P3: Perform Quick Data Exploration
CU-4. Perform data Visualization	P1: Prepare the Data P2: Determine Where the Visualization Will Be Rendered P3: Set up the Figure(s) P4: Connect to and Draw Your Data P5: Organize the Layout P6: Preview and Save Your Beautiful Data Creation
CU-5. Create Line charts	P1: Demonstrate Visual Representation P2: use Matplotlib P3: Perform Fixing Axis Ticks P4: Perform Adding of Axis Labels and Title
CU-6. Create Multiple plots	P1: Apply Matplotlib Classes P2: Perform Grid Positioning P3: Perform Formatting and Spacing P4: Perform Overlaying Line Charts P5: Perform Adding More Lines P6: Perform Adding a Legend

<p>CU-7. Create bar plots and scatter plots</p>	<p>P1:create bar Plot P2:Create bars P3:Align Axis Ticks and Labels P4:Create Horizontal Bar Plot P5:Create Scatter plot P6:Create Switching axes P7:Create Benchmarking correlation</p>
<p>CU-8. Display Histograms and box plots</p>	<p>P1:Show Frequency Distribution P2:Perform Binning P3:Apply Histogram in Matplotlib P4:Compare histograms P5:demonstrate Quartiles P6:Create Box Plot P7:Create Multiple Box Plots</p>
<p>CU-9. Implement Color, layout and annotations</p>	<p>P1:Set line Color Using RGB P2:Set Line Width P3:Set Layout and Ordering P4:Replace the Legend with Annotations P5:Perform Annotation in Matplotlib</p>
<p>CU-10.Create Conditional plots</p>	<p>P1:Create Histograms in Seaborn P2:Create Kernel Density Plot P3:Modify appearance of the Plots P4:Perform Conditional Distributions P5:Create Conditional Plots P6:Perform Legend addition</p>
<p>CU-11.Visualize geographic data</p>	<p>P1:Apply Geographic Data and Coordinate Systems P2:Apply Basemap P3:Convert Spherical coordinates to Cartesian Coordinates P4:Perform customization using Basemap and Matplotlib P5:Apply Great Circles</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:**Learn and understand Loading of Data set
- K2:** Learn and understand convert a variable to different data type
- K3:** Learn and understand From Data to Visualization

K4: Learn and understand Multiple plots.

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Plot data using various techniques

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer System
2	Python IDE

0619I&CT12.Utilize Libraries in Python

Overview:

This competency standard covers the general overview of python most used libraries like NumPy, Pandas, Matplotlib and Keras.

Competency Units	Performance Criterion
CU-1. Explore NumPy library	<p>P1: Install NumPy</p> <p>P2: Use various NumPy data types in a program</p> <p>P3: Use NumPy to perform indexing and slicing</p> <p>P4: Compute on NumPy arrays</p> <p>P5: Sort arrays using NumPy</p> <p>P6: Use NumPy's structured arrays</p>
CU-2. Explore pandas' libraries	<p>P1: Install pandas.</p> <p>P2: Introduce pandas' objects</p> <p>P3: Operate data using pandas.</p> <p>P4: Handle missing data</p> <p>P5: Combine datasets</p> <p>P6: Use aggregation and Grouping</p>
CU-3. Explore Matplotlib library	<p>P1: Import matplotlib</p> <p>P2: Perform simple scatter plot</p> <p>P3: Visualize errors</p> <p>P4: Use density and contour plots</p> <p>P5: Use histograms, binning and density</p> <p>P6: Use multiple subplots</p> <p>P7: Perform three-dimensional plotting</p>
CU-4. Explore Keras Library	<p>P1: Install Keras.</p> <p>P2: Load image data from MNIST.</p> <p>P3: Pre-process input data for keras</p> <p>P4: Pre-process class labels for keras</p> <p>P5: Define model architecture</p> <p>P6: Compile model</p> <p>P7: Fit model on training data</p> <p>P8: Evaluate model on test data</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K5:** Learn about python libraries
- K6:** Installing of libraries
- K7:** Learn data types in python
- K8:** Learn fixed type arrays in python
- K9:** Learn NumPy standard data types
- K10:** Basics of NumPy arrays
- K11:** Learn NumPy Array Attribute
- K12:** Learn array indexing and slicing
- K13:** Learn Reshaping of Arrays
- K14:** Exploring NumPy's UFuncs
- K15:** Learn about Sorting Arrays
- K16:** Perform Fast Sorting in NumPy: np.sort and np.argsort
- K17:** Learn Partial Sorts: Partitioning
- K18:** Learn Structured Data: NumPy's Structured Arrays
- K19:** Creating Structured Arrays
- K20:** Introducing Pandas Object
- K21:** The Pandas Series Object
- K22:** The Pandas DataFrame Object
- K23:** Learn Data Indexing and Selection
- K24:** Data Selection in Series
- K25:** Data Selection in DataFrame
- K26:** Operating on Data in Pandas
- K27:** Learn Ufuncs: Index Preservation
- K28:** Learn UFuncs: Index Alignment
- K29:** Learn Ufuncs: Operations Between DataFrame and Series
- K30:** Learn about Handling Missing Data
- K31:** Learn about Hierarchical Indexing
- K32:** Learn about Combining Datasets: Concat and Append
- K33:** Learn about Combining Datasets: Merge and Join
- K34:** Learn Relational Algebra
- K35:** Learn Categories of Joins
- K36:** Learn Simple Line Plots
- K37:** Adjusting the Plot: Line Colors and Styles

- K38:** Learn Simple Scatter Plots
- K39:** Scatter Plots with plt.plot and plt.scatter
- K40:** Learn Density and Contour Plots
- K41:** Learn about Visualizing a Three-Dimensional Function
- K42:** Learn about Histograms, Binnings, and Density
- K43:** Learn Two-Dimensional Histograms and Binnings
- K44:** Learn about Multiple Subplots
- K45:** Learn about plt.axes: Subplots by Hand
- K46:** Learn about Three-Dimensional Points and Lines
- K47:** Learn about Three-Dimensional Contour Plots

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Implement python libraries using dataset.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer
2	Python IDE
3	Python Libraries

0619I&CT13.Apply Data Structures and Algorithm

Overview:

This competency standard covers analysis and design of fundamental data structures and engage learners to use data structures as tools to algorithmically design efficient computer programs that will cope with the complexity of actual applications.

Competency Units	Performance Criterion
CU-1. Identify the lists and algorithm complexity	<p>P1: Implement Array Lists and Linked Lists</p> <p>P2: Use algorithms for manipulating single, double, and circular linked lists</p> <p>P3: Remove time-complexity issues - definitions of Big-O</p> <p>P4: Analyze algorithms to determine their running time and order of their running time</p>
CU-2. Implement Stacks and Queues	<p>P1: Make Algorithms for manipulating stacks and queues.</p> <p>P2: Implement stacks and queues</p>
CU-3. Perform Recursion	<p>P3: Use Recursion and analyze recursion algorithms</p> <p>P4: Unfold the recursive program by coding it non-recursively.</p> <p>P5: Create the stack frames for a recursive program</p>
CU-4. Explore Trees	<p>P1: Create algorithms for tree traversals, insertions, deletions</p> <p>P2: Implement and use Binary Search trees, Heaps/Priority Queues.</p> <p>P3: Use depth first and breadth first traversal</p>
CU-5. Create Sets, Maps and Hash Tables	<p>P1: Create algorithms for Sets and Maps</p> <p>P2: Implement Sets, Maps and Hash Tables.</p>
CU-6. Apply Sorting Algorithms	<p>P1: Implement different sorting algorithms</p> <p>P2: Use selection, insertion, merge, quick, bubble, heap, shell, radix and bucket.</p> <p>P3: Analyze several sorting algorithms to determine their running time and the order of their running time</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Learn abstract data types

- K2:** Learn about complexity analysis
- K3:** Learn about Big-O notation
- K4:** Learn and understand about stacks (linked lists and array implementation)
- K5:** Learn about recursion
- K6:** Analyzing recursive algorithms
- K7:** Understand divide and conquer algorithms
- K8:** Exploring various sorting algorithms (selection, insertion, merge, quick, bubble, heap, shell, radix and bucket)
- K9:** Understand linked list and its various types
- K10:** Learn sorted linked list
- K11:** Understand about binary search for sorted array
- K12:** Learn about hashing and indexing
- K13:** Understanding about trees and tree traversals
- K14:** Exploring binary tree search, heaps, graphs
- K15:** Understand depth first and breadth first traversal
- K16:** Learn about topological order and shortest path
- K17:** Learn about memory management and garbage collection

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Compare various tree search algorithms
2. Implement and compare different sorting algorithms.
3. Implement stacks and queues.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo	DESCRIPTION
1	Computer
2	Python IDE

0619I&CT14.Use Python as Mathematics Tool

Overview:

In this competency standard student will able to learn how to use NumPy, SciPy, Metaplot and Pandas as mathematical tool to solve different problems of statistic, calculus, exponential distribution, and normal distribution.

Competency Units	Performance Criterion
CU-1. Apply functions of NumPy library	P1: Identify basic functions of NumPy library P2: Import library in python shell P3: Perform library function to generate array. P4: Perform trigonometric function using NumPy
CU-2. Apply functions of SciPy library	P1: Identify functions of SciPy library P2: Import library in python shell P3: Perform library function to generate array. P4: Perform trigonometric function using SciPy
CU-3. Apply functions of Matplotlib library	P1: Identify basic functions of Matplotlib library P2: Import library in python shell P3: Perform library function to generate array. P4: Generate graph and plots using Matplotlib Library.
CU-4. Apply basic functions of Panda library	P1: Identify basic function of pandas library P2: Import library in python shell P3: Perform library function to generate array. P4: Perform trigonometric function using Pandas.
CU-5. Apply normal distribution using Python	P1: Identify normal distribution in probability P2: Import library in python shell P3: Create dataset P4: Apply normal distribution using Python.
CU-6. Apply exponential distribution in Python	P1: Identify exponential distribution in probability P2: Import library in python shell P3: Create dataset P4: Apply exponential distribution using Python.
CU-7. Apply Statistics in Python	P1: Identify basic statistics functions P2: Classify functions of statistics P3: Import library in python shell P4: Create dataset P5: Apply mean function in Python P6: Apply Mode function in Python P7: Apply Median function in python
CU-8. Apply calculus in Python	P1: Import Library P2: Create equation P3: Apply derivative on Python P4: Apply Integration on Python

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Understanding and learning of NumPy library
- K2:** Understanding and learning of SciPy library
- K3:** Understanding and learning of MetaPlot library
- K4:** Understanding and learning of Panda Library
- K5:** Understanding and learning of Probability
- K6:** Understanding and learning of statistics

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform operations on NumPy Library
2. Perform operations on SciPy Library
3. Perform operations on MetaPlot Library
4. Perform operations on SimPy Library
5. Perform operations on Panda Library
6. Perform operations on Probability using Python
7. Perform operations on Statistics using Python

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	SciPy library
4	Metaplot Libray
5	Panda Library
6	NumPy Libray
7	Simpy Libray

0619I&CT15.Develop Concepts on Machine Learning – I (Supervised)

Overview:

This competency standard will cover the concepts of supervised machine learning using Support Vector Machine (SVM) as a classifier of Linear Regression and Nonlinear Regression as machine learning tool.

Competency Units	Performance Criterion
CU-1. Implement Support Vector Machine (SVM)	P1: Identify machine learning techniques P2: Implement the supervised learning-based approach P3: Implement on linearly separable data P4: Build linear non-probabilistic binary classifier using hyper-plane method
CU-2. Implement linear regression	P1: Identify linear regression P2: Implement data pre processing P3: Split the data into training and testing dataset P4: Implement the algorithm P5: Train the data P6: Calculate coefficient of Linear Regression P7: Find the Error rate from the target value
CU-3. Implement multiple linear regression	P1: Identify multiple regression P2: Implement data pre processing P3: Split the data into training and testing dataset P4: Implement the algorithm P5: Train the data P6: Calculate coefficient of Multiple Linear Regression P7: Find the Error rate from the target value
CU-4. Implement nonlinear Regression	P1: Identify logistic regression P2: Implement data pre processing P3: Split the data into training and testing dataset P4: Implement the algorithm P5: Train the data P6: Calculate coefficient of Nonlinear Regression P7: Find the Error rate from the target value

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understand machine learning

K2: Understand Type of machine learning

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Implement Support Vector Machine on dataset
2. Implement Linear regression machine on dataset

Tools & Equipment required:

SNo.	DESCRIPTION
1	Advanced analytical tool (Numpy, Pandas, Scipy, Spark)
2	Artificial intelligence tool (Keras, Tensor Flow)
3	Programming tool -Python

0619I&CT16.Develop Concepts on Machine Learning – II (Unsupervised)

Overview:

This competency standard will cover the concepts of unsupervised machine learning using K-Means clustering methods.

Competency Units	Performance Criterion
CU-1. Identify Clustering methods	<p>P1: Identify unsupervised machine learning</p> <p>P2: Identify unsupervised machine learning methods</p> <p>P3: Identify clustering methods</p> <p>P4: Identify clustering algorithms</p> <p>P5: Identify clustering evaluation criteria</p> <p>P6: Identify K-means clustering</p> <p>P7: Identify K centroids</p>
CU-2. Implement K-mean Clustering method	<p>P1: Create the Data Frame using IRIS data set</p> <p>P2: Use Scikit-Learn for K- means clustering</p> <p>P3: Import the data in Python</p> <p>P4: Plot Scatter Graph</p> <p>P5: Cluster the data</p> <p>P6: Plot the cluster</p> <p>P7: Plot the centroids</p> <p>P8: Find the closest centroid</p> <p>P9: Update cluster assignments</p> <p>P10: Move the centroids to the center of their clusters</p> <p>P11: Plot the data and the centers generated as random</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Unsupervised Machine learning.
- K2:** Clustering analysis.
- K3:** Understand and implement K-means Clustering
- P12:** Unsupervised machine learning
- P13:** Unsupervised machine learning methods
- P14:** Clustering methods
- P15:** Clustering algorithms

P16: Clustering evaluation criteria

P17: K-means clustering

K4: K-centroids

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform K-Means clustering on data set.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer System
2	IDE
3	Python

0619I&CT17.Develop Concepts on Machine Learning III (Deep learning)

Overview:

This competency standard will cover the concepts of deep learning with supervised and unsupervised learning methods.

Competency Units	Performance Criterion
CU-1. Implement supervised learning methods using convolutional network	P1: Identify deep learning network structure P2: Identify deep learning models P3: Identify Supervised learning in deep learning P4: Identify reinforcement learning P5: Identify convolution neural network P6: Implement data pre processing P7: Split the data into training and testing dataset P8: Implement the convolutional network algorithm P9: Train the data P10: Validate the data P11: Find the Error rate from the target value
CU-2. Implement unsupervised learning methods using K-Means' Algorithm	P1: Identify unsupervised learning in deep learning P2: Create the Data Frame using IRIS data set P3: Use Scikit-Learn for K- means clustering P4: Run the data in Python P5: Create charts P6: Cluster the data P7: Plot the cluster P8: Plot the centroids P9: Find the closest centroid & update cluster assignments P10: Move the centroids to the center of their clusters P11: Plot the data and the centers generated as random using IRIS data set

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understanding the concept of deep learning

K2: Understanding the history of deep learning

- K3:** Difference between deep learning v/s machine learning
- K4:** Understand classification with deep learning
- K5:** Understanding neural network structure
- K6:** Difference between a Generative and Discriminative Algorithm
- K7:** Understanding deep learning model
- K8:** Application of Deep Learning in medical
- K9:** Application of Deep Learning in speech recognition
- K10:** Application of Deep Learning in drug discovery
- K11:** Application of Deep Learning in Bioinformatics
- K12:** Application of Deep Learning in medical image analysis
- K13:** Application of Deep Learning in Military

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Classification between deep learning and machine learning.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo	DESCRIPTION
1	Computer system
2	Python shell
3	TensorFlow

0619I&CT18.Implement Artificial Neural Network

Overview:

This Artificial Neural Network module will make to learn and understand the how to implement the basic concept of Artificial Neural Network.

Competency Units	Performance Criterion
<p>CU-1. Implement perceptron Neural Network</p>	<p>P1: Identify the structure of an ANN. P2: Identify types of nodes P3: Identify types of layers P4: Identify types of Activation function. P5: Identify the concept of Weights P6: Identify types of networks: feed forward and feedback ward P7: Identify the basic concepts of training algorithms P1: Implement perceptron Neural Network P2: Assign the random weight to all linkage P3: Use hidden nodes and find the activation rate</p>
<p>CU-2. Implement Artificial Neural Network</p>	<p>P1: Import libraries P2: Import data set P3: Identify the variable P4: Visualize the dataset P5: Normalize the dataset P6: Split the data set P7: Define the input layer with input nodes P8: Define weights P9: Determine the output layer P10: Train the network P11: Validate the network P12: Calculate the error P13: Compute efficiency of the network</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understand the Historical Background of Biological neurons

K2: Understand A Model of a Single Neuron

K3: Introduce the McCulloch and Pitts proposed the first computational model of a neuron

K4: Introduce the Hebb proposed first learning rule

K5: Learn and understand the concept of Biological network

K6: Learn and understand the concept of training and testing dataset.

K7: Learn and understand the concept of Input Layer, Hidden Layer, and Output layer in neural network

K8: Learn and understand the concept of weight and activation system

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Implement perceptron Neural Network and assign random weight it all linkage.
2. Find the activation rate and use hidden nodes.

Tools & Equipment required:

SNo.	DESCRIPTION
1	Computer System
2	IDE
3	Python

0619I&CT19.Implement Feed Forward Neural Network

Overview:

This Feed forward Neural Network module will make student to learn and implement Feed forward Neural Network using python. Student will learn and implement Single layer feed forward network and multilayer feed forward neural network.

Competency Units	Performance Criterion
<p>CU-1. Implement Feed Forward Artificial Neural Network</p>	<p>P1: Identify the Feed Forward Artificial Neural Network P2: Identify the concept of error and optimization P3: Identify the concept of gradient P4: Import libraries P5: Import data set P6: Identify the variable P7: Visualize the dataset P8: Normalize the dataset P9: Split the data set P10: Define the input layer with input nodes P11: Define weights P12: Define hidden layer with hidden nodes P13: Determine the output layer P14: Train the network P15: Validate the network P16: Calculate the error P17: Compute efficiency of the network</p>
<p>CU-2. Implement multilayer feed forward Neural Network</p>	<p>P1: Implement the supervised learning-based approach P2: Assign the random weight to all linkage P3: Using hidden nodes find the activation rate of hidden nodes. P4: Using the activation rate of hidden node and linkage find the activation rate of output node P5: Find the Error rate at output node P6: Adjust the weight between hidden nodes and input nodes. P7: Repeat till converges criteria met P8: Using the final linkage weight score the activation rate of</p>

	output node.
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Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Learn and understand the concept of Biological network

K2: Learn and understand the concept of training and testing dataset.

K3: Learn and understand the concept of Input Layer, Hidden Layer, and Output layer in neural network

K4: Learn and understand the concept of weight and activation

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Implement feed forward neural network on dataset.

Tools & Equipment required:

SNo.	DESCRIPTION
1	Computer System
2	IDE
3	Python

0619I&CT20.Implement Backpropagation Training Algorithm

Overview:

This backpropagation Training Algorithm module will make student to learn and implement backpropagation training Algorithm with python.

Competency Units	Performance Criterion
CU-1. Identify back propagation Training Algorithm	<p>P1: Identify back propagation Training Algorithm</p> <p>P2: Identify Back Propagation Error.</p> <p>P3: Identify the supervised learning using based Back Propagation approach</p>
CU-2. Implement back propagation Training Algorithm	<p>P1: Initialize Network</p> <p>P2: Implement weights</p> <p>P3: Create hidden layers</p> <p>P4: Assign the random weight to all linkage</p> <p>P5: Create hidden nodes</p> <p>P6: Find the activation rate of hidden nodes.</p> <p>P7: Using the activation rate of hidden node and linkage find the activation rate of output node</p> <p>P8: Calculate Back Propagation Error</p> <p>P9: Find the Error rate at output node</p> <p>P10: Adjust the weight between hidden nodes and input nodes.</p> <p>P11: Repeat till converges criteria met</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understand how to forward-propagate an input to calculate an output.

K2: Understand how to back-propagate error and train a network.

K3: Understand how to apply the back-propagation algorithm to a real-world predictive modeling problem.

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Implement back propagation Training Algorithm on dataset

Tools & Equipment required:

SNo.	DESCRIPTION
1	Computer System
2	Python IDE

0619I&CT21.Implement K Means Clustering Algorithm

Overview:

This K Means Algorithm module will make student to learn K Means Algorithm, a form of artificial intelligence. Student will learn machine learning concepts and techniques including unsupervised learning, mathematical and heuristic aspects, hands-on modeling to develop algorithms.

Competency Units	Performance Criterion
CU-3. Identify K-Means Clustering for unsupervised learning	<p>P1: Identify and calculate Euclidean Distance</p> <p>P2: Calculate the distance between data instance</p> <p>P3: Locate most similar data instances</p> <p>P4: Split the data set into training and validation.</p> <p>P5: Recalculate the means</p>
CU-4. Implementing K nearest neighbor for Unsupervised Learning	<p>P1: Implement the unsupervised learning-based approach</p> <p>P2: Import the data</p> <p>P3: Initialize the set of point as K Mean</p> <p>P4: Assign each point to the cluster belonging to the nearest k mean</p> <p>P5: Find the new mean</p> <p>P6: Calculate Class cluster</p> <p>P7: Calculate Class cluster group</p> <p>P8: Repeat the steps until convergence achieve</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Learn and understand the concept of K means

K2: Learn and understand the concept of training and testing dataset.

K3: Learn and understand the K nearest neighbor

K4: Learn and understand the K nearest neighbor for Supervised Learning.

K5: Learn and understand clustering concept.

K6: Clustering algorithms, prototype-based clustering

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Implementing K nearest neighbor for Unsupervised Learning on dataset

Tools & Equipment required:

SNo.	DESCRIPTION
1	Computer System
2	IDE
3	Python

0619I&CT22.Implement Convolutional Neural Network

Overview:

In this competency standard student will learn and implement convolutional neural network, also known as convnets or CNN, is a well-known method in computer vision applications. This type of architecture is dominant to recognize objects from a picture or video.

Competency Units	Performance Criterion
CU-1. Configure Input layer	P1: Get image from dataset P2: Break image into 2D/3D matrix P3: Scale features. P4: Create filter to get image features
CU-2. Perform Convolution layer	P1: Develop convolution layer with input layer P2: Develop filter to extract feature P3: Apply filter on input data set of images P4: Identify size of matrix P5: Use stride where necessary. P6: Use ReLU function for removing non-linearity where necessary.
CU-3. Perform Pooling layer	P1: Apply pooling layer P2: Identify size of matrix P3: Apply function <code>tf.layers.max_pooling2d</code>
CU-4. Add convolution layer and pooling layer	P1: Add multiple convolution layer where necessary P2: Apply multiple pooling layer where necessary
CU-5. Perform dense layer	P1: Perform dense layer function P2: Convert Data into fully connected layers P3: Activation function applied

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1:Understanding and learning of image composition

K2:Understanding and learning of convolution layer operation

K3:Understanding and learning of removing non-linearity

K4:Understanding and learning of pooling layer operation

K5:Understanding and learning of classification of fully connected layer

K6:Understanding and learning of filter generation

K7:Understanding and learning of adding more layers and their justification.

K8:Understanding and learning of dense layer

K9:Understanding and learning of logit layer

K10: Understanding and learning of predicting new data set.

K11: Understanding and learning of classification of data

K12: Understanding and learning of ReLU function.

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform pooling layer operation.
2. Perform convolution layer operation.
3. Perform Classification of data set.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo	DESCRIPTION
1	Computer system
2	Python shell
3	TensorFlow library/KERAS

Overview:

Natural Language Processing (NLP) is the sub-field of AI that is focused on enabling computers to understand and process human languages. Here, we will check out how NLP works and learn how to write programs that can extract information out of raw text using Python.

Competency Units	Performance Criterion
<p>CU-1. Identify Natural Language Processing</p>	<p>P1: Identify sentence P2: Identify sentence segmentation P3: Identify noun P4: Identify paragraph P5: Identify word P6: Identify word Tokenization P7: Identify stop words P8: Identify noun phrase P9: Identify Spacy library</p>
<p>CU-2. Search entities in sentences</p>	<p>P1: Import library P2: Create text P3: Perform natural language processing on text P4: Extract entities from sentences</p>
<p>CU-3. Extract Semi-structured statement</p>	<p>P1: Import library P2: Create text P3: Perform NLP on text P4: Extract semi-structured statements from text.</p>
<p>CU-4. Extract Noun</p>	<p>P1: Import library P2: Create text P3: Perform NLP on text P4: Extract noun from text.</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understanding and learning Natural language processing concept

K2: Understanding of sentence.

K3:Understanding sentence segmentation

K4:Understanding Noun.

K5:Understanding Paragraph

K6:Understanding word

K7:Understanding word tokenization.

K8:Understanding Spacy library

K9:Understanding entities.

K10: Understanding entities extraction

K11: Understanding semi-structured statements.

K12: Understanding extraction of semi-structured statements

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform extraction of NOUN from sentences.
2. Perform extraction of ENTITIES from sentences.
3. Perform sentence segmentation from sentence

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	Spacy library

0619I&CT24.Implement Text Analytics

Overview:

In this module students will be able to learn how to implement text analytics to identify text, convert case of text, and convert text to speech. One of the biggest breakthroughs required for achieving any level of artificial intelligence is to have machines which can process text data.

Competency Units	Performance Criterion
CU-1. Identify Text analytics	<p>P1: Identify number of words</p> <p>P2: Identify number of characters</p> <p>P3: Identify average word length</p> <p>P4: Identify number of stop words</p> <p>P5: Identify number of special characters</p> <p>P6: Identify number of numeric</p> <p>P7: Identifying stop words</p> <p>P8: Identify lowercase, uppercase, etc.</p> <p>P9: Identify Spacy library</p> <p>P10: Identify String library</p>
CU-2. Convert text to lowercase	<p>P1: Import library</p> <p>P2: Create text</p> <p>P3: Perform lowercase operation on text</p> <p>P4: Print lowercase data.</p>
CU-3. Convert Text to speech	<p>P1: Import library gTTS</p> <p>P2: Create text</p> <p>P3: Choose language</p> <p>P4: Convert text to speech and save file</p> <p>P5: Run speech file.</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Understanding and learning Natural language processing concept

K2: Understanding of sentence.

K3: Understanding sentence segmentation

K4: Understanding Noun.

- K5:**Understanding Paragraph
- K6:**Understanding word
- K7:**Understanding word tokenization.
- K8:**Understanding Spacy library
- K9:**Understanding string library
- K10:** Understanding gTTS data set
- K11:** Understanding entities.

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform text to speech narration from sentences.
2. Perform data analytics on text description

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	Spacy library
4	String library

Overview:

In these modules students will learn to develop the basic Object detection system which has seen a rapid adoption rate in various and diverse industries.

Competency Units	Performance Criterion
<p>CU-1. Setup Installation</p>	<p>P1: Install the following libraries</p> <ul style="list-style-type: none"> a. Protobuf 3.0.0 b. Python-tk c. Pillow 1.0 d. lxml e. tf Slim (which is included in the "tensorflow/models/research/" checkout) f. Jupyter notebook g. Matplotlib h. Tensorflow (>=1.12.0) i. Cython j. contextlib2 k. cocoapi <p>P2: Add Libraries to PYTHONPATH</p> <p>P3: Test the Tensorflow Object Detection API.</p>
<p>CU-2. Check Object Detection API Demo</p>	<p>P1: Import libraries</p> <p>P2: Get tensorflow/models or cd to parent directory of the repository.</p> <p>P3: Compile protobufs and install the object_detection package</p> <p>P4: Import the object detection module.</p> <p>Code the Loader function for base url "http://download.tensorflow.org/models/object_detection/"</p> <p>P5: Load the label map</p> <p>P6: Perform test on 2 images:</p> <p>P7: Load an object detection model</p> <p>P8: Check the model's input signature, it expects a batch of 3-color images of type uint8:</p> <p>P9: Reruns several outputs</p> <p>P10: Add a wrapper function to call the model, and cleanup the outputs</p>

	<p>P11: Run it on each test image and show the results:</p> <p>P12: Perform instance segmentation model which includes a detection_masks output:</p>
CU-3. Run the model	<p>P1:Run the model</p> <p>P2:Determine the efficiency of the model</p> <p>P3:Check the following github repository for assistance in this project</p> <p>https://github.com/tensorflow/models/tree/master/research/object_detection</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Anaconda library
- K2:** Programming environment
- K3:** ImageAI library
- K4:** Pretrained model
- K5:** RetinaNet
- K6:** Model implementation

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform object detection on image using pretrained model.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	ImageAI library
4	RetinaNet
5	Anaconda library

0619I&CT26.Develop Characters Recognition System

Overview:

In this module student will learn to develop the character recognition system on the MNIST dataset and able to explore the data, perform data preprocessing, building the convolutional neural network, compiling and fitting the model and at the end how to evaluate the model.

Competency Units	Performance Criterion
CU-1. Identify the MNIST dataset	P1: Open python shell P2: Download MNIST data set P3: Import libraries P4: Read data set from CSV file P5: Distribute features and target
CU-2. Explore the Data	P1: Explore no. of samples in data set P2: Explore no. of features in data set P3: Measure pixels of image P4: Explore visualization of data P5: Explore intensity level of data
CU-3. Perform Data preprocessing	P1: Perform Reshaping of data P2: Perform Normalizing of data
CU-4. Building the Convolutional Neural Network	P1: Apply Conv2D layer P2: Apply max pooling layer P3: Apply flatten function P4: Apply dense layer P5: Apply dropout function
CU-5. Compiling and Fitting the Model	P1: Apply function for optimization P2: Fit the model using train data set
CU-6. Evaluation of model	P1: Evaluate develop model by giving random input image P2: Check the efficiency of Model

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1:Understanding and learning of image composition

K2: Understanding and learning of convolution layer operation

- K3:** Understanding and learning of removing non-linearity
- K4:** Understanding and learning of pooling layer operation
- K5:** Understanding and learning of classification of fully connected layer
- K6:** Understanding and learning of filter generation
- K7:** Understanding and learning of adding more layers and their justification why.
- K8:** Understanding and learning of dense layer
- K9:** Understanding and learning of logit layer
- K10:** Understanding and learning of predicting new data set.
- K11:** Understanding and learning of model evaluation
- K12:** Understanding and learning of MNIST data set
- K13:** Understanding and learning of classification of data

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform hand written number recognition system.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	TensorFlow library

0619I&CT27.Develop Fraud Detection System

Overview:

Introduce deep autoencoder to detect fraudulent credit/debit card transactions on a Kaggle dataset. It performs an exploratory data analysis, then create and later evaluate the model. The model will be presented using Keras with a TensorFlow backend using a Jupyter Notebook and generally applicable to a wide range of anomaly detection problems.

Competency Units	Performance Criterion
CU-1. Manage required libraries	P1: Import required libraries P2: Download fraud detection data set from 'Kaggle'
CU-2. Visualize the dataset	P1: Pre-process of data for training. P2: Visualize data in multiple graph P3: Classify data set P4: Visualize no. of transactions
CU-3. Training of the Model	P1: Split data into train set and test set P2: Configure parameters required for model development P3: Create model training and logging
CU-4. Evaluate the Model	P1: Estimate model loss P2: Reconstruct error check P3: Check Receiver operating characteristic (ROC) curves P4: Recall vs. Precision Thresholding

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Python libraries

K2: Kaggle dataset

K3: Pre-process data

K4: Visualize dataset

K5: Data classification

K6: Model development

K7: Recall vs. Precision Thresholding

K8: Reconstruction error check

K9: Receiver operating characteristic (ROC) curves

K10: Recall vs. Precision Thresholding

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Apply fraud detection techniques
2. Validate fraud detection test

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	Python libraries

0619I&CT28.Develop Forecasting for Stock Market

Overview:

Historical data about the stock prices of a publicly listed company. We will implement a mix of machine learning algorithms to predict the future stock price of this company, starting with simple algorithms.

Competency Units	Performance Criteria
CU-1. Perform Data preprocessing	P1: Perform Reshaping of data P2: Perform Normalizing of data
CU-2. Visualize the Dataset	P1: Explore no. of samples in data set P2: Explore no. of features in data set P3: Measure pixels of image P4: Explore visualization of data P5: Explore intensity level of data
CU-3. Implement Forecast USA_Housing.csv in python	P1: Preprocess data P2: Indexing with time series data P3: Visualizing Time Series Data P4: Time series forecasting with regression P5: Find correlation between data sets P6: Apply linear regression P7: Train test split P8: Prediction of the data set P9: Visualize the prediction
CU-4. Evaluate the Model	P1: Evaluate develop model by giving random input data P2: Estimate model loss P3: Reconstruct error check P4: Check Receiver operating characteristic (ROC) curves P5: Recall vs. Precision Thresholding

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Python libraries

K2:Pre-process data

K3:Visualize dataset

K4:Data classification

K5:Training of data

K6:Model development

CU-5. Evaluation of model

K7:Estimate Model Loss

K8:Receiver operating characteristic (ROC) curves

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Develop forecasting for stock market and evaluate the model.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	Python libraries

Overview:

In this competency standard student will learn to develop a Chat robot, a computer program that simulates human conversation, or chat, through artificial intelligence. Typically, a chat bot will communicate with a real person using Text Pre- Processing with NLTK

Competency Units	Performance Criterion
CU-1. Import Libraries and modules	P1: Downloading and installing NLTK P2: InstallNLTK Packages
CU-2. Perform Text Pre-Processing with NLTK	P1: Convert the entire text into uppercase or lowercase P2: Convert the normal text strings into a list of tokens P3: Remove Noise P4: Remove Stop words P5: Reduce inflected P6: Performs Lemmatization
CU-3. Perform Data Process with NTLK	P1: transform text into a meaningful vector P2: Label the text P3: Score the frequency of the word in the current document. P4: Inverse the document frequency P5: Apply cosine similarity P6: Read the data P7: Analyze Keywords matching P8: Generate Response P9: Run the program

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1:Learn and Understand Downloading and installing NLTK

K2:Learn and Understand InstallNLTK Packages

K3:Learn and Understand to convert the entire text into uppercase or lowercase

K4:Learn and Understand to convert the normal text strings into a list of tokens

K5:Learn and Understand to Remove Noise

K6:Learn and Understand to Remove Stop words

K7:Learn and Understand to Reduce inflected

K8:Learn and Understand to Performs Lemmatization

K9: Learn and Understand to transform text into a meaningful vector

K10: Learn and Understand to Label the text

K11: Learn and Understand to Score the frequency of the word in the current document.

K12: Learn and Understand to Inverse the document frequency

K13: Learn and Understand to Apply cosine similarity

K14: Learn and Understand to Read the data

K15: Learn and Understand to Analyze Keywords matching

K16: Learn and Understand to Generate Response

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Demonstrate the steps of text preprocessing
2. Perform the NLTK based task to recognize the keywords matching and respond according to it.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	Python libraries

0619I&CT30.Develop Self Driving Vehicle

Overview:

In this module students will conclude all of his/her expertise in a nutt shell by developing a project called a self-driving RC car using Raspberry Pi, Arduino and open source software. Raspberry Pi collects inputs from a camera module and an ultrasonic sensor, and sends data to a computer wirelessly. The computer processes input images and sensor data for object detection (stop sign and traffic light) and collision avoidance respectively. A neural network model runs on computer and makes predictions for steering based on input images. Predictions are then sent to the Arduino for RC car control.

Competency Units	Performance Criterion
CU-1. Identify the system design	<p>P1: Identify the Objective of the project</p> <p>P2: Identify the requirement of system</p> <p>P3: Identify the subunit of the system</p> <p>P4: Identify the tools for the system</p> <p>P5: Identify the sensors and actuators</p>
CU-2. Identify the Input unit	<p>P1: Connect raspberry pi with camera module and HC-SR04 ultrasonic sensor</p> <p>P2: Develop the two-client program on raspberry pi</p> <p>P3: Run the program to stream color video</p> <p>P4: Run the program to get ultrasonic sensor data to the computer</p> <p>P5: Set up the local Wi-Fi with computer</p> <p>P6: Set the video to Low latency video streaming.</p>
CU-3. Identify the Processing Unit	<p>P1: Setup multithread TCP Server on computer to get data from raspberry pi and ultrasonic sensor</p> <p>P2: Train the neural network</p> <p>P3: Convert image frame to gray scale</p> <p>P4: Decode data into NumPy arrays</p> <p>P5: Run Prediction model to steer the vehicle.</p>
CU-4. Implement Object Detection	<p>P1: Apply shape-based approach</p> <p>P2: Apply used Haar feature-based cascade</p> <p>P3: Apply Gaussian Filter</p> <p>P4: Then Spot the brightest point</p>

	P5: Validate the Image
CU-5. Build RC Car Control Unit	P1: Connect Arduino to the computer via using USB P2: Set computer outputs commands to Arduino using serial interface
CU-6. Setting up environment with Anaconda	P1: Install miniconda (Python3) on your computer P2: Create auto-RC car environment with all necessary libraries for this project P3: Activate auto-RC car environment

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Basic sensor and actuator

K2: Anaconda library

K3: Raspberry pin GPIO

K4: Arduino IDE

K5: Programming environment

K6: OpenCV library

K7: ANN model

K8: Model implementation

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Draw the Flow Chart to show the data flow of the aforementioned application.
2. Implement Object Detection technique to detect the light of traffic signal

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1	Computer system
2	Python shell
3	OpenCV library
4	Raspberry pi
5	Arduino

DIGITAL SKILLS

0619I&CT31.Perform Basics Computer Operations

Overview:

This competency introduces computing skills which will make student to learn basic computing skills.

Competency Units	Performance Criterion
CU-7. Identify basic components of computers	P4: Identify basic components of computers P5: Identify CPU P6: Identify memory P7: Identify input/output and other peripheral devices
CU-8. Identify storage devices of computers	P1: Classify and Use of storage media and devices P2: Use of physical and logical storage P3: Use of file storage system
CU-9. Identify different types of software	P1: Use system software P2: Use application software P3: Use operating systems
CU-10. Explore the internet and web	P1: Use internet applications P2: Use E-mail P3: Use internet and world wide web

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K9:** Learn History of computers
- K10:** Learn and understand basic components of computer
- K11:** Learn and understand about CPU
- K12:** Learn and understand about memory
- K13:** Learn and understand about input/output and other peripheral devices
- K14:** Learn about storage devices and its types
- K15:** Learn about software types
- K16:** Learn about system software/operating system
- K17:** Learn about application software
- K18:** Exploring internet and world wide web
- K19:** Learn about E-mail service

Critical Evidence (s) required:

The trainee needs to produce the following critical evidence (s) to be competent in this competency standard:

3. Identify computer components
4. Use World Wide Web and E-mail service.
5. Identify and Use various software.

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	Description
1.	Computer System
2.	Operating System (Software)
3.	Computer Hardware Components
4.	Internet connection

0619I&CT32.Use Operating System and Computer Hardware

Overview:

This unit describes the performance outcomes, skills and knowledge required to select, configure and use computer operating systems and basic computer peripherals.

Competency Units	Performance Criterion
CU-1. Identify operating system and Computer peripherals	P1: Determine ICT organizational requirements and specifications P2: Identify and select appropriate operating system P3: Identify appropriate external hardware components P4: Identify internal hardware components
CU-2. Install and configure operating system and application software with hardware components	P1: Install and configure operating system to meet organizational requirements P2: Identify the functions associated with the operating system and associated boot process P3: Configure power-management settings to minimize power consumption as an environmentally sustainable measure P4: Use both the graphical user interface and the command line interface to perform basic tasks P5: Install or upgrade application software and perform hardware configuration P6: Determine the relationship between application program, operating system and hardware P7: Identify general differences between different computer platforms and related operating systems
CU-3. Optimize operating system and hardware components	P1: Optimize operating system using included tools or third-party utilities P2: Perform customization on graphical user interface P3: Use various commands in command line interface P4: Set up and configure external hardware components and check functionality P5: Install appropriate drivers and check functionality

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Basic knowledge of current industry-accepted operating system, hardware and software products
- K2:** Compatibility of an operating system, with respect to other versions
- K3:** Function of single-user and multi-user operating systems
- K4:** Interoperability between operating systems
- K5:** Occupational Health & Safety principles and responsibilities, including ergonomic principles to avoid injury associated with using computer systems

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Perform fragmentation/ defragmentation on storage devices
2. Identify and install suitable hardware components
3. Install and upgrade application software.
Execute various commands in command line interface of the operating system

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

Sr. No	DESCRIPTION
1.	Computer
2.	Operating System software
3.	Computer Hardware Components
4.	Internet connection

0619I&CT33.Use Word Processor

Overview:

This unit describes the skills and knowledge required to operate word- processing applications and perform basic operations, including creating and formatting documents, creating tables and printing documents. It applies to individuals in the workplace using fundamental knowledge of word-processing under direct supervision or with limited responsibility.

Competency Units	Performance Criterion
CU-1. Create document (s)	<p>P1:Open word-processing application, create document and add data according to information requirements</p> <p>P2:Use document templates as required</p> <p>P3:Use simple formatting tools when creating the document</p> <p>P4:Save document to desired directory/drive</p>
CU-2. Customize basic settings to meet page layout standards	<p>P1:Adjust page layout to meet information requirements</p> <p>P2:Open and view different toolbars</p> <p>P3:Change font format to suit document purpose</p> <p>P4:Change alignment and line spacing according to document information requirements</p> <p>P5:Modify margins to suit the document purpose</p> <p>P6:Open and switch between several documents</p>
CU-3. Apply Fonts on document	<p>P1:Use formatting features and styles as required</p> <p>P2:Highlight and copy text from another area in the document or from another active document</p> <p>P3:insert headers and footers</p> <p>P4:convert document to other type</p> <p>P5:Save document to a storage device</p>
CU-4. Create tables	<p>P1:Insert a table into document</p> <p>P2:perform cell operations to meet requirements</p> <p>P3:Insert and delete columns and rows as required</p> <p>P4:Use formatting tools according to style requirements</p>
CU-5. Add images	<p>P1:Insert image(s) into document and customize as required</p> <p>P2:Position and resize image (s) to meet document formatting needs</p>
CU-6. Print documents	<p>P1:Preview document in print preview mode</p> <p>P2:Select basic print settings</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes:

K1: Describe formatting styles and their effect on document,

K2: Identify organizational requirements for ergonomics, including work periods and breaks

K3: Select organizational style guide to use

K4: Describe purpose, use and function of word-processing software.

Critical Evidence (s) required:

The trainee needs to produce following critical evidence(s) to be competent in this competency standard:

1. Create, open and retrieve documents using customized basic settings
2. Format document by creating tables and adding text, objects and images
3. Save and print document(s)

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

Sr. No	DESCRIPTION
1.	Computer System
2.	Operating System Software
3.	Microsoft Office
4.	Computer Hardware Components
5.	Internet Connection

0619I&CT34.Operate Presentation Package

Overview:

This unit describes the skills and knowledge required to work on presentation applications and perform various presentations

Competency Units	Performance Criterion
CU-1. Create presentation (s)	P1: Open blank presentation and add text and graphics P2: Apply existing styles and themes in a presentation P3: create a presentation from available template P4: Use custom animation tools to improve the look of the presentation P5: Save presentation to the appropriate storage device and folder
CU-2. Customize basic settings	P1: Adjust the view to meet user requirements P2: Open and view different toolbars to view options P3: Ensure font settings are appropriate for the presentation purpose P4: View multiple slides at once
CU-3. Format presentations	P1: Use and incorporate organizational charts and bulleted lists, and modify as required P2: Add objects and manipulate to meet presentation purposes P3: Import objects and modify for presentation purposes P4: Modify slide layout, including text and colors, to meet presentation requirements P5: Use formatting tools as required within the presentation P6: Duplicate slides within and across a presentation P7: Reorder sequence of slides and delete slides for presentation purposes P8: Save presentation in another format P9: Save to storage device and close presentation
CU-4. Add slideshow effects	P1: Incorporate animation and multimedia effects into presentation as required P2: Add slide transition effects to presentation to ensure smooth progression through the presentation P3: Test presentation for overall effect P4: Use onscreen navigation tools to start and stop slide show or move between different slides as required
CU-5. Print presentation and	P1: Select appropriate print format for presentation

notes	<p>P2: Select preferred slide orientation</p> <p>P3: Add notes and slide numbers</p> <p>P4: Preview slides and run spell check before presentation</p> <p>P5: Print selected slides and submit presentation to appropriate person for feedback</p>
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Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

K1: Outline the different types of:

K2: Formal and informal presentations

K3: Audience

K4: Explain the effect of design and formatting on the readability and usability of presentations

K5: Outline presentation advantages

K6: Identify suitable presentation effects for different audiences

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Create, format and prepare presentations for display
2. Customize basic settings
3. Add slide show effects

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

Sr. No	DESCRIPTION
1.	Computer system
2.	Operating System software
3.	Microsoft Office
4.	Computer Hardware Components
5.	Internet connection

0619I&CT35.Use Spreadsheet Applications

Overview:

This unit describes the skills and knowledge required to operate word- processing applications and perform basic operations, including creating and formatting documents, creating tables and printing labels. It applies to individuals in the workplace using fundamental knowledge of word-processing under direct supervision or with limited responsibility.

Competency Units	Performance Criterion
<p>CU-1. Create spreadsheets</p>	<p>P1:Open the spreadsheet application, create spreadsheet files and enter numbers, text and symbols into cells according to information requirements</p> <p>P2:Enter simple formulas and functions using cell referencing when required</p> <p>P3:Correct formulas when error messages occur</p> <p>P4:Use a range of common tools during spreadsheet development</p> <p>P5:Edit columns and rows within the spreadsheet</p> <p>P6:Use the auto-fill function as per requirement</p> <p>P7:Save the spreadsheet to a folder on a storage device</p>
<p>CU-2. Customize basic settings</p>	<p>P1:Adjust page layout to meet user requirements or special needs</p> <p>P2:Open and view different toolbars</p> <p>P3:Change font settings so they are appropriate for the document purpose</p> <p>P4:Change alignment options and line spacing according to spreadsheet formatting features</p> <p>P5:Format cell to display different styles as required</p> <p>P6:change spreadsheet margins</p> <p>P7:View multiple spreadsheets concurrently</p>
<p>CU-3. Format spreadsheet</p>	<p>P1:Use formatting features as required</p> <p>P2:Copy selected formatting features from another cell in the spreadsheet or from another active spreadsheet</p> <p>P3:Use formatting tools as required within the spreadsheet</p> <p>P4:Align information in a selected cell as required</p>

	<p>P5: Insert headers and footers using formatting features</p> <p>P6: Save spreadsheet as another file type</p> <p>P7: Save to storage device and close spreadsheet</p>
<p>CU-4. Incorporate object and chart in spreadsheet</p>	<p>P1: Import an object into an active spreadsheet</p> <p>P2: Manipulate imported object by using formatting features</p> <p>P3: Create a chart using selected data in the spreadsheet</p> <p>P4: Display selected data in a different chart</p> <p>P5: Modify chart using formatting features</p>
<p>CU-5. Print spreadsheet</p>	<p>P1: Preview spreadsheet in print preview mode</p> <p>P2: Select basic printing settings</p> <p>P3: Print spreadsheet or selected part of spreadsheet</p> <p>P4: Submit the spreadsheet to appropriate person for approval or feedback</p>

Understanding and Knowledge:

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standard, which includes the knowledge of:

- K1:** Explain the effect of formatting and appearance on the readability and usability of spreadsheets
- K2:** Describe the purpose, use and function of spreadsheet applications

Critical Evidence (s) required:

The trainee needs to produce following critical evidence (s) to be competent in this competency standard:

1. Create spreadsheets
2. Customize basic settings
3. Format spreadsheets
4. Create basic formulas
5. Insert objects and charts in spreadsheets
6. Save and print spreadsheets

Tools & Equipment required:

The tools and equipment required for this competency standard are given below:

SNo.	DESCRIPTION
1.	Computer system
2.	Operating System software

3. Microsoft Office
4. Computer Hardware Components
5. Internet connection

0619I&CT36. Operate Digital Media Technology

Overview:

This unit describes the performance outcomes, skills and knowledge required to identify, select and use a digital media package and supporting technologies.

Unit of Competency	Performance Criteria
CU-1. Use appropriate OHS office work practices	P1: Use safe work practices to ensure ergonomic, work organization, energy and resource conservation requirements are addressed P2: Use wrist rests and document holders where appropriate P3: Use monitor anti-glare and radiation reduction screens where appropriate
CU-2. Identify and select appropriate digital media package	P1: Identify the basic requirements of a design brief, including user environment P2: Research and review suitable available digital media packages P3: Select an appropriate digital media package to meet design brief requirements
CU-3. Use digital media package	P1: Procure or create suitable data to meet requirements of the brief P2: Manipulate data using digital media package tools P3: Ensure naming and storing of documents in appropriate file format in directories or folders
CU-4. Review digital media design	P1: Evaluate design for creative, dramatic and technical quality, file size, and suitability to meet the brief P2: Test and run any incorporated graphics, video or sound as part of a digital media presentation and present designs in the appropriate format P3: Review final product against design brief

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1:Basic principles of visual design

K2:Functions and features of digital media packages and technologies

K3:Graphic design and stylistic language conventions

K4: OHS principles and responsibilities for ergonomics, such as work periods and breaks

K5: Principles of digital imaging and file formats, video and sound file formats, file management and transfer systems

K6:Vendor product directions in digital media hardware and software

K7:Visualization and interpreting creative information, scripts (text) and images

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to identify, select and use a digital media package and supporting technologies. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence of the ability to:

1. Identify basic requirements of a design brief
2. Use digital media package to meet organizational requirements
3. Use OHS principles and responsibilities for ergonomics, such as work periods and breaks
4. Use help manuals and online help when appropriate
5. Use digital media technologies to support design brief requirements.

0619I&CT37.Create User Documentation

Overview:

This unit describes the performance outcomes, skills and knowledge required to create user documentation that is clear to the target audience and easy to navigate.

Unit of Competency	Performance Criteria
CU-1. . Determine documentation standards and requirements	P1: Determine documentation requirements P2: Investigate documentation and industry standards for requirements and determine appropriate application to user documentation P3: Design documentation templates using appropriate software and obtain approval from appropriate person
CU-2. Produce user documentation	P1: Conduct a review of the subject system, program, network or application in order to understand its functionality P2: Gather existing technical, design or user specifications and supporting documentation P3: Create user documentation based on template to record the operation of the subject system, program, network or application
CU-3. Review and obtain sign-off	P1: Submit user documentation to target audience for review P2: Gather and analyze feedback Make changes to user documentation P3: Submit user documentation to appropriate person for approval

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:**Content features, including clarity and readability
- K2:**Document design, web design and usability
- K3:**Functions and features of templates and style guides
- K4:**Instructional design principles

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create user documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to create user documentation that:

1. Meets business requirements
2. Caters for a diverse readership
3. Is clear to the target audience
4. Is easy to navigate.

0619I&CT38.Create Technical Documentation

Overview:

This unit describes the performance outcomes, skills and knowledge required to create technical documentation that is clear to the target audience and easy to navigate.

Unit of Competency	Performance Criteria
CU-1. Identify and analyze documentation requirements and client needs	P1: Consult with client to identify documentation requirements P2: Interpret and evaluate documentation requirements and confirm details with client P3: Investigate industry and documentation standards for requirements P4: Define and document the scope of work to be produced P5: Consult with client to validate and confirm the scope of work
CU-2. Design documentation	P1: Identify information requirements with reference to layout and document structure P2: Create document templates and style guides consistent with information requirements P3: Conduct a review of the system in order to understand its functionality P4: Extract content that meets information requirements according to copyright restrictions P5: Develop the structure of the technical documentation giving focus to the flow of information, style, tone and content format P6: Validate the technical documentation structure with the client
CU-3. Develop documentation	P1: Write technical documentation based on the template and scope of work using the information gathered P2:P2. Translate technical terminology into plain English where appropriate P3:P3. Apply content format and style according to documentation standards and templates
CU-4. Evaluate and edit documentation	P1: Submit technical documentation to appropriate person for review P2: Gather and analyze feedback P3: Incorporate alterations into the technical documentation

	P4: Edit the technical documentation for technical and grammatical accuracy
CU-5. Prepare documentation for publication	P1: Check that the completed technical documentation meets client requirements and scope of work P2: Submit the technical documentation to appropriate person for approval P3: Prepare the technical documentation for publication and distribution using appropriate channels

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K5:** Content features, such as clarity and readability
- K6:** Document design, web design and usability
- K7:** Functions and features of templates and style guides
- K8:** Instructional design principles
- K9:** Organizational policies, procedures and standards that cover document design.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create technical documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to:

1. Establish customer needs
2. Design and develop technical documentation, such as system, procedures, training material and user guides, incorporating appropriate standards
3. Update document with client feedback
4. Prepare documentation for publication.

0619I&CT39.Use social media tools for collaboration and engagement

Overview:

This unit describes the performance outcomes, skills and knowledge required to establish a social networking presence using social media tools and applications. The unit specifically identifies the requirement to review, compare and use different types of social networking tools and applications.

Unit of Competency	Performance Criteria
CU-1. Describe different types of social media tools and applications	P1: Explain characteristics of the term social media P2: Identify different types of social-media tools and applications P3: Illustrate some of the issues associated with the use of social media tools and applications
CU-2. Compare different types of social media tools and applications	P1: Select one social media type for review P2: Review most popular tools and applications within that social media type P3: Itemize benefits across a range of the most popular tools and applications P4: Select most appropriate social media tool or application
CU-3. Set up and use popular social media tools and applications	P1: Identify social media tools and applications for possible implementation P2: Initiate preferred social media tools and applications for use P3: Establish social media interface using text and file content P4: Initiate social networking interaction P5: Test and evaluate tools and applications for ease of use P6: Present findings

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Basic technical terminology in relation to social networking and social media applications and tools
- K2:** Basic knowledge of uploading images, text files, pdf files, audio files, video files and link associated files
- K3:** Features and functions of social media applications
- K4:** Import and export software functions
- K5:** Linking documents
- K6:** OHS principles and responsibilities for ergonomics, including work periods and breaks
- K7:** Tagging to facilitate collaborative folksonomy
- K8:** Social media applications and procedures for connecting to social networking sites
- K9:** Use of input and output devices
- K10:** Use of RSS feeds to connect a social network.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to create technical documentation that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to:

1. Establish customer needs
2. Design and develop technical documentation, such as system, procedures, training material and user guides, incorporating appropriate standards

0619I&CT40. E-Commerce – SEO (Search Engine Optimization)

Overview:

This competency unit covers to develop efficient E-Marketing strategies in accordance with the Vision and Mission statement of the organization driven by Electronic means.

Unit of Competency	Performance Criteria
CU-1. SEO (Search Engine Optimization)	P7: Apply SEO techniques P8: Employ SEO key words P9: Demonstrate SEO techniques to priorities their site or web application using automated tools

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** SEO Methods but not limited to Getting Indexed, Preventing Crawling, and Increasing Prominence.
- K2:** White-hat, Black-hat SEO techniques for web application
- K3:** SEO key words for web pages' translation.

Critical Evidence(s) Required

A person who demonstrates competency in this unit must be able to provide evidence of the ability to write and edit copy that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

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0619I&CT41.E-Commerce – SCM (Supply Chain Management)

Overview:

This competency unit covers to develop efficient E-Marketing strategies in accordance with the Vision and Mission statement of the organization driven by Electronic means.

Unit of Competency	Performance Criteria
CU-1. SCM (Supply Chain Management)	<p>P1: Identity potential Suppliers</p> <p>P2: Select the appropriate supplier</p> <p>P3: Place order as per requirement/inventory</p> <p>P4: Inspect received order</p> <p>P5: Maintain Inventory as per Inventory Control / store keeping techniques</p> <p>P6: Identity different available transportation mode</p> <p>P7: Identify steps of reverse SCM i-e from consumer to organization</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Procurement Cycle (Launch of RFP/RFQ, Tender, Bidding, Comparative Statement, Award of Contract, Maintenance)
- K2:** Different techniques to manage
- K3:** Product delivery and their traceability
- K4:** Incorporation of Outsourcing in logistics.
- K5:** Electronic Data Interchange methodologies and format

Critical Evidence(s) Required

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to write and edit copy that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Overview:

This competency unit covers to develop efficient E-Marketing strategies in accordance with the Vision and Mission statement of the organization driven by Electronic means.

Unit of Competency	Performance Criteria
CU-1. 1. Social Media Marketing	P1: Identify different Social media marketing techniques P2: Apply suitable Classified Advertisement techniques on social media P3: Perform Electronic Mail Marketing P4: Create Blogs

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Describe Knowledge of different social media sites that is Facebook, Twitter, LinkedIn, Google+ etc., Comparative Statement, Award of Contract, Maintenance)
- K1:** Brand pages' creation on social media sites.
- K2:** Familiarity of banner ads integration on different web sites like newspaper site in any demographic region.
- K3:** Skills to regularly update brand/product/service blogs.
- K4:** Electronic Data Interchange methodologies and format
- K5:** Direct marketing techniques e.g. Email, SMS (Mobile- Commerce) for the projection of company newsletters

Critical Evidence(s) Required

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to implement e-marketing strategies that is clear to the target audience and easy to navigate. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

ENTREPRENEURIAL SKILLS

0619I&CT43.Develop Entrepreneurial Skills

Overview:

This Competency Standard identifies the competencies required to develop entrepreneurial skills by Hotel manager, in accordance with the organization's approved guidelines and procedures. You will be expected to develop a business plan, collect information regarding revenue generation, develop a marketing plan and develop basic business communication skills. Your underpinning knowledge regarding entrepreneurial skills will be sufficient to provide you the basis for your work.

Unit of Competency	Performance Criteria
CU-1. 1. Develop a business plan	<p>P1. Conduct a market survey to collect following information</p> <ul style="list-style-type: none"> Business Model Financials Equipment Estimation Revenue Generation Sources Marketing strategy Market Trends Overall Expenses <p>P2. Select the best option in terms of cost, service, quality, sales, operational expenses</p> <p>P3. Compile the information collected through the market survey, in the business plan format</p>
CU-2. 2. Develop a	P1. Make a marketing plan for the service products, price,

marketing plan	placement, promotion, people, packaging and positioning P2. Include the information of marketing plan in the business plan
CU-3. 3. Develop basic business communication skills	P1. Communicate with guests using effective communication skills P2. Use different modes of communication to communicate effectively e.g.: presentation, speaking, writing, listening, visual representation, reading etc. P3. Use specific business terms used in the market

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1:7Ps of marketing including product, price, placement, promotion, people, packaging and positioning

K2:7Cs of business communication

K3:Different modes of communication and their application in the industry

K4:Specific business terms used in the industry

K5:Available funding sources

K6:Low interest loans to start a new business

K7:Market survey and its tools e.g: questionnaire, interview, observation etc

K8:Market trends for specific product offering

K9:State the main elements of business plan

K10: Business plan format

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

- List 7Ps

0619I&CT44.Apply project information management and communications techniques

Overview:

This unit describes the skills and knowledge required to provide a critical link between people, ideas and information at all stages in the project life cycle. It involves assisting the project team to plan communications, communicating information related to the project, and reviewing communications. It applies to individuals who are project practitioners working in a project support role.

Unit of Competency	Performance Criteria
CU-1. Contribute to communications planning	<p>P1. Identify, source and contribute relevant information requirements to initial project documentation</p> <p>P2. Contribute to developing and implementing the project communications plan and communications networks</p>
CU-2. Conduct information-management activities	<p>P1. Act on and process project information according to agreed procedures as directed, to aid decision-making processes throughout project life cycle</p> <p>P2. Maintain information to ensure data is secure and auditable</p>
CU-3. Communicate project information	<p>P1. Communicate with clients and other stakeholders during project using agreed networks, processes and procedures to ensure flow of necessary information</p> <p>P2. Ensure reports are prepared and released according to authorization, or produced for release by others</p> <p>P3. Seek information and advice from appropriate project authorities as required</p>
CU-4. Contribute to assessing effectiveness of communication	<p>P1. Assist in ongoing review of project outcomes to determine effectiveness of communication-management activities</p> <p>P2. Report communications-management issues and responses to higher project authorities for application of lessons learned to future projects</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Summarize models and methods of communications management in context of project life cycle and other project management functions
- K2:** Importance of managing risk by treating information securely
- K3:** Methods of reviewing outcomes
- K4:** Organizational policies and procedures relevant to this role in a specific context.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

0619I&CT45.Apply Project Human Resources Management

Overview:

This unit describes the skills and knowledge required to assist with aspects of human resources management of a project. It involves establishing human resource requirements, identifying the learning and development needs of people working on the project, facilitating these needs being met, and resolving conflict in the team. It applies to individuals who are project practitioners working in a project support role.

Unit of Competency	Performance Criteria
1. Assist in determining human resource requirements	<p>P1. Analyze work breakdown structure to determine human resource requirements</p> <p>P2. Prepare a skills analysis of project personnel against project task requirements</p> <p>P3. Assist in assigning responsibilities for achieving project deliverables</p>
2. Contribute to establishing and maintaining productive team relationships	<p>P1. Actively seek views and opinions of team members during task planning and implementation</p> <p>P2. Promote cooperation and effective activities, goals and relationships within team</p> <p>P3. Communicate with others using styles and methods appropriate to organizational standards, group expectations and desired outcomes</p> <p>P4. Communicate information and ideas to others in a logical, concise and understandable manner</p> <p>P5. Regularly seek feedback on nature and quality of work relationships, and use feedback as basis for own improvement and development</p>
3. Assist with human resource monitoring	<p>P1. Monitor work of project personnel against assigned roles and responsibilities within delegated authority levels</p> <p>P2. Monitor and control actual effort against project plan</p> <p>P3. Review skill levels against allocated tasks and recommend solutions, where required to others</p> <p>P4. Advise others within delegated authority when assigned responsibilities are not met by project personnel</p> <p>P5. Undertake work in a multi-disciplinary environment according</p>

	<p>to established human resource management practices, plans, guidelines and procedures</p> <p>P6. Resolve conflict within delegated authority according to agreed dispute-resolution processes</p> <p>P7. Assist in offering human resource development opportunities to individuals with skill gaps</p>
4. Contribute to evaluating human resource practices	<p>P1. Contribute to assessing effectiveness of project human resources management</p> <p>P2. Document lessons learned to support continuous improvement processes</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- Alternative project personnel engagement options
- Job design principles and work breakdown structures
- Learning and development approaches that can be incorporated into project life cycle
- Methods for skills analysis
- Project roles, responsibilities and reporting requirements for human resources.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to apply project human resources management approaches. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

0619I&CT46.Develop Project Management Plan

Overview:

This unit describes the skills and knowledge to develop a plan for a hotel management plan, including assessing project requirements and planning for all stages to completion and final documentation.

Unit of Competency	Performance Criteria
<p>CU-1. Prepare project management plan</p>	<p>P1. Evaluate and assess project brief and related documents</p> <p>P2. Produce document on project tasks and associated timelines, including installation processes and test requirements</p> <p>P3. Assess and produce document on resource requirements to assist allocation of appropriate resources</p> <p>P4. Produce training plan assessing training needs and associated timelines for efficient project implementation</p> <p>P5. Determine and document budgetary requirements</p> <p>P6. Discuss roles of all identified parties associated with project to ensure their involvement</p> <p>P7. Produce project verification document, including monitoring and control processes, and review processes such as quality audits</p> <p>P8. Consult with all relevant parties prior to finalizing draft plan and make changes as appropriate</p>
<p>CU-2. Develop and evaluate management plan</p>	<p>P1. Produce preliminary plan for consultation, including identified factors that may impact on realization of project and observance of relevant legislation, codes, regulation and standards</p> <p>P2. Consult with client and clarify any amendments</p> <p>P3. Develop final plan with recommendations</p>
<p>CU-3. Communicate project information</p>	<p>P1. Produce and document final plan to include implementation details and training needs</p> <p>P2. Present plan to client and obtain sign off</p>
<p>CU-4. Contribute to assessing effectiveness of</p>	<p>P1. Assist in ongoing review of project outcomes to determine effectiveness of communications-management activities</p>

communication	P2. Report communications-management issues and responses to higher project authorities for application of lessons learned to future projects
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1:Key attributes of common telecommunications applications and related equipment

K2:Evaluate the connections to carrier infrastructure or equipment

K3:Current legislation relating to the design of installation of telecommunications equipment and connection to carrier services

K4:Advantages of leasing and purchase options to assist in delivering cost effective solutions

K5:Evaluate network and transmission equipment

K6:Network topologies, interface and interconnect solutions

K7:Workplace health and safety (WHS) issues that need to be built into a plan, with consideration of:

- a. electrical safety
- b. materials handling
- c. physical hazards
- d. confined spaces
- e. heights
- f. lifting

K8:Evaluate the power requirements and electrical safety aspects of the installation plan

K9:Performance parameters and typical faults that may be encountered in client equipment and related connection and transmission media

K10: Various test equipment types suitable for tests to be made

K11: Warranty information for equipment supplies and contractor work guarantees.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to develop a project management plan. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

- P5.** Determine the project attributes and specifications
- P6.** Prepare a coherent draft project management plan
- P7.** Consult on and revise a project management plan
- P8.** Document final project management plan and obtain sign off

0619I&CT47.Develop sales Plan

Overview:

This unit describes the skills and knowledge required to develop a sales plan for a product or service for a team covering a specified sales territory based on strategic objectives and in accordance with established performance targets. It applies to individuals working in a supervisory or managerial sales role who develop a sales plan for a product or service.

Unit of Competency	Performance Criteria
CU-1. . Identify organizational strategic direction	P1. Obtain and analyze assessment of market needs and strategic planning documents P2. Review previous sales performance and successful approaches to identify factors affecting performance P3. Analyze information on market needs, new opportunities, customer profiles and requirements as a basis for decision making P4. Carry out competitor analysis for rate structure
CU-2. Establish performance targets	P1. Determine practical and achievable sales targets P2. Establish realistic timelines for achieving targets P3. Determine measures to allow for monitoring of performance P4. .Ensure objectives of the sales plan and style of the campaign are consistent with organizational strategic objectives and corporate image
CU-3. Develop a sales plan for a product	P1. Determine approaches to be used to meet sales objectives P2. Identify additional expertise requirements and allocate budgetary resources accordingly P3. Identify risks and develop risk controls P4. Develop advertising and promotional strategy for product P5. Identify appropriate distribution channels for product P6. Prepare a budget for the sales plan P7. Present documented sales plan to appropriate personnel for approval
CU-4. Identify support requirements	P1. Identify and acquire staff resources to implement sales plan

	<p>P2. Develop an appropriate selling approach</p> <p>P3. Train staff in the selling approach selected</p> <p>P4. Develop and assess staff knowledge of product to be sold</p>
<p>CU-5. Monitor and review sales plan</p>	<p>P1. Monitor implementation of the sales plan</p> <p>P2. Record data measuring performance versus sales targets</p> <p>P3. Make adjustments to sales plan as required to ensure required results are obtained</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Outline principles and techniques for selling

K2: Outline methods for monitoring sales outcomes

K3: Statistical techniques for analyzing sales and market trends

K4: Internal and external sources of information that are relevant to identifying organizational strategic direction and developing a product sales plan.

K5: Competitors intelligence

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to develop a sales plan. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

K1:Analyze information from a range of sources to develop a sales plan for a product and sales territory that meets organizational strategic direction including:

- a. Resource requirements and budget
- b. Achievable sales targets
- c. Performance measures

d. Approaches to be used to meet objectives

e. Risk management

f. Advertising and promotional strategy

g. Product distribution channels

K2: Acquire staff, develop selling approach and provide training support on product knowledge and sales approach

K3: Monitor and evaluate performance and adjust the plan as appropriate.

0619I&CT48. Address customer needs

Overview:

This unit describes the skills and knowledge required to manage an ongoing relationship with a customer over a period of time. This includes helping customers articulate their needs and managing networks to ensure customer needs are addressed. It applies to individuals who are expected to have detailed product knowledge in order to recommend customized solutions. In this role, individuals would be expected to apply organizational procedures and be aware of, and apply as appropriate, broader factors involving ethics, industry practice, relevant government policies and regulations.

Unit of Competency	Performance Criteria
CU-1. Assist customer to articulate needs	P1. Ensure customer needs are fully explored, understood and agreed P2. match the available services and products to customer needs P3. Identify and communicate rights and responsibilities of customers to the customer as appropriate
CU-2. Satisfy complex customer needs	P1. Explain possibilities for meeting customer needs P2. Assist customers to evaluate service and/or product options to satisfy their needs P3. Determine and prioritize preferred actions P4. Identify potential areas of difficulty in customer service delivery and take appropriate actions in a positive manner
CU-3. Manage networks to ensure customer needs are addressed	P1. Establish effective regular communication with customers P2. Establish, maintain and expand relevant networks to ensure appropriate referral of customers to products and services from within and outside the organization P3. Ensure procedures are in place to ensure that decisions about targeting of customer services are based on up-to-date information about the customer and the products and services available P4. Ensure procedures are put in place to ensure that referrals are based on the matching of the assessment of customer needs

	<p>and availability of products and services</p> <p>P5.Maintain records of customer interaction in accordance with organizational procedures</p>
CU-4. Convert customer enquiries into sales	<p>P1. Use information provided by customers or accessed from the customer relationship management (CRM) system to identify any needs</p> <p>P2. Identify suitable products/services to meet the needs/requirements</p> <p>P3. Make convincing sales pitches to customers following standard scripts</p> <p>P4. Handle customer queries, objections and rebuttals following standard scripts</p> <p>P5. Adapt your approach and style to customer preferences, within the limits of your competence and authority</p> <p>P6. Refer issues outside your area of competence and authority to appropriate people, following your organization's procedures</p> <p>P7. Identify and act on opportunities to up-sell or cross-sell other products/services to customers</p> <p>P8. Confirm customer wishes and needs in order to close sales</p> <p>P9. Obtain required financial information from customers, following your organization's procedures</p> <p>P10.Complete your organization's post-sales procedures in order to complete/ fulfill sales</p> <p>P11. Comply with relevant standards, policies, procedures and guidelines when converting customer enquiries into sales</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1:Organizational procedures and standards for establishing and maintaining customer service relationships

K2:Consumer rights and responsibilities

K3:Ways to establish effective regular communication with customers

- Outline details of products or services including with reference to:
- possible alternative products and services
- Variations within a limited product and service range.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to address customer needs. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

P9. . Demonstrated evidence is required of the ability to:

- a. address customers needs
- b. check your work is complete and free from errors
- c. use organizational procedures to document customer satisfaction
- d. develop and maintain networks to support meeting customer needs

P10. Identify potential difficulties in meeting customer needs and taking appropriate action.

- a. communicate effectively with customers including
- b. helping customers to articulate their needs and evaluate options
- c. explaining products/services and how they match customer needs
- d. establishing regular communication
- e. explaining customer rights and responsibilities

0619I&CT49.Manage personal finances

Overview:

This unit of competency describes the outcomes required to develop, implement and monitor a personal budget in order to plan regular savings and manage debt effectively.

Unit of Competency	Performance Criteria
<p>CU-1. Develop a personal budget</p>	<p>P1. Calculate current living expenses using available information to prepare a personal budget.</p> <p>P2. Keep a record of all income and expenses for a short period of time to help estimate ongoing expenses.</p> <p>P3. Subtract total expenses from total income to determine a surplus or deficit budget for the specified period.</p> <p>P4. Find reasons for a deficit budget and ways to reduce expenditure identified.</p> <p>P5. Identify ways to increase income, if possible</p>
<p>CU-2. Develop longer term personal budget</p>	<p>P1. Analyze income and expenditure set longer term personal, work and financial goals.</p> <p>P2. Develop a longer-term budget based on the outcomes of short-term budgeting, and adjust to meet living, work and future career requirements.</p> <p>P3. Identify obstacles that might affect finances such as job loss, sickness or unexpected expenses contingency savings</p> <p>P4. Formulate a regular savings plan based on budget, using secure savings products and services.</p> <p>P5. Monitor expenditure against budget and identify areas of possible expenditure saving</p>
<p>CU-3. Identify ways to maximize future finances</p>	<p>P1. Determine sources and ways to maximize personal income, including from work, investments or available government payments/allowances.</p> <p>P2. Get further education or training to maintain or improve future income.</p> <p>P3. Identify the need for debt to finance living and other expenses, and determine the appropriate levels of debt and repayment.</p>

	<p>P4. Consolidate existing debt, where possible, to minimize interest costs and fees.</p> <p>P5. Seek professional money management services, where available, to ensure financial plans are effective and achievable.</p>
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Abilities to plan and organize to keep records and monitor a personal budget

K2: Abilities to set and review goals

K3: Basic financial management and record keeping to enable development and management of a personal budget

K4: Benefits of financial goal setting and personal budgeting to enable effective management of personal finances

K5: Numeracy skills to compare income and expenditure

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to manage personal finances. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to:

P1. Develop a personal budget based on analysis of expenditure and income;

P2. Formulate goals and identify financial contingency plans; and

P3. Monitor expenditure for a period of up to 2 weeks.

0619I&CT50.Solve problems which jeopardize safety and security

Overview:

This unit is focus on negotiation in critical incidents and the development of strategic responses designed to resolve threatening incidents.

Unit of Competency	Performance Criteria
CU-1. 1. Identify a problem	<p>P1. Form a problem statement and analyze root cause.</p> <p>P2. Take initiative in tackling problems rather than relying solely on directives</p> <p>P3. Follow logic steps in understanding root cause and analyzing potential solutions.</p>
CU-2. 2. Determine strategies for a required solution	<p>P1. Analyze all aspects of the incident for degree of hazard, priorities, optional outcomes and appropriate strategies</p> <p>P2. Analyze and determine strategies and priorities on the incident sought from a range of sources</p> <p>P3. Assess long term objectives against resources and priorities</p> <p>P4. Apply a range of communication techniques to make and maintain contact with the key people</p> <p>P5. Provide clear and factual information to enable an honest and realistic assessment of the interests of the key people and their positions</p> <p>P6. Resolve the conflict and express their likely consequences clearly and do an analysis of the benefits</p> <p>P7. Reassess points of disagreements for common positive Positions</p>
CU-3. 3. Coordinate support services	<p>P1. Assess the need for support services in terms of the determined strategies and priorities</p> <p>P2. Negotiate the resources of support services according to established procedures and availability</p> <p>P3. Provide information on strategies to support services and maintain the communication</p> <p>P4 .Delegate roles and responsibilities according to expertise and resources</p>
CU-4. 4. Restore order	P1 .Assess the incidents for degree of risk and take appropriate

	<p>action to reduce and remove the impact of the incident and restore order</p> <p>P2 .Take action designed to minimize risk and the preserve the safety and security of all involved</p> <p>P3 .Take action to prevent the escalation of the incident appropriate to the circumstances and agreed procedures.</p> <p>P4 .Carry out the use of force for the restoration of control and the maintenance of security in the least restrictive manner.</p> <p>P5 .Complete reports accurately and clearly provided to the appropriate authority promptly</p> <p>P6 .Review, evaluate and analyze the incident and the organizational response to it and report it promptly and accurately.</p>
<p>CU-5. Provide leadership. direction and guidance to the work group</p>	<p>P1. Link between the function of the group and the goals of the organization</p> <p>P2 .Participate in decision making routinely to develop, implement and review work of the group and to allocate responsibilities where appropriate</p> <p>P3 .Give opportunities and encouragement to others to develop new and innovative work practices and strategies</p> <p>P4. Identify conflict and resolve with minimum disruption to work group function</p> <p>P5.Provide staff with the support and supervision necessary to perform work safely and without risk to health</p> <p>P6.Allocate tasks within the competence of staff and support with appropriate authority, autonomy and training</p> <p>P7.Supervise appropriately the changing priorities and situations and takes into account the different needs of individuals and the requirements of the task</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1:Organization's policies, guidelines and procedures related to control and surveillance, safety and preventing and responding to incidents and breaches of orders covered in the range of variables.

K2:Organization's management and accountability systems

K3:Teamwork principles and strategies

K4:Principles of effective communication

K5: Guidelines for use of equipment and technology

K6: Code of conduct

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to resolve problems which jeopardize safety and security. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

SOFT SKILLS

0619I&CT51.Manage Meetings

Overview:

This unit describes the skills and knowledge required to manage a range of meetings including overseeing the meeting preparation processes, chairing meetings, organizing the minutes and reporting meeting outcomes. It applies to individuals employed in a range of work environments who are required to organize and manage meetings within their workplace, including conducting or managing administrative tasks in providing agendas and meeting material. They may work as senior administrative staff or may be individuals with responsibility for conducting and chairing meetings in the workplace.

Unit of Competency	Performance Criteria
CU-1. Prepare for meetings	<p>P1: Develop agenda in line with stated meeting purpose</p> <p>P2: Ensure style and structure of meeting are appropriate to its purpose</p> <p>P3: Identify meeting participants and notify them in accordance with organizational procedures</p> <p>P4: Confirm meeting arrangements in accordance with requirements of meeting</p> <p>P5: Dispatch meeting working papers to participants within designated timelines</p>
CU-2. Conduct meetings	<p>P1: Chair meetings in accordance with organizational requirements, agreed conventions for type of meeting and legal and ethical requirements</p> <p>P2: Conduct meetings to ensure they are focused, time efficient and achieve the required outcomes</p> <p>P3: Ensure meeting facilitation enables participation, discussion, problem-solving and resolution of issues</p> <p>P4: Brief minute-taker on method for recording meeting minutes in accordance with organizational requirements and conventions for type of meeting</p>
CU-3. Follow up meetings	<p>P1: Check transcribed meeting notes to ensure they reflect a true and accurate record of the meeting and are formatted in</p>

	<p>accordance with organizational procedures and meeting conventions</p> <p>P2: Distribute and store minutes and other follow-up documentation within designated timelines, and according to organizational requirements</p> <p>P3: Report outcomes of meetings as required, within designated timelines</p>
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Outline meeting terminology, structures, arrangements
- K2:** Outline responsibilities of the chairperson and explain group dynamics in relation to managing meetings
- K3:** Describe options for meetings including In-person/physical, teleconferencing, web-conferencing and using webcams
- K4:** Identify the relevant organizational procedures and policies regarding meetings, chairing and minutes including identifying organizational formats for minutes and agendas.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to manage meetings. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to:

P1: Apply conventions and procedures for formal and informal meetings including:

- a. Developing and distributing agendas and working papers
- b. Identifying and inviting relevant meeting participants
- c. Organizing and confirming meeting arrangements

P2: Running the meeting and following up

- a. Organize, take part in and chair a meeting
- b. Record and store meeting documentation
- c. Follow organizational policies and procedures

0619I&CT52.Manage Workforce Planning

Overview:

This unit describes the skills and knowledge required to manage planning in relation to an organization's workforce including researching requirements, developing objectives and strategies, implementing initiatives and monitoring and evaluating trends. It applies to individuals who are human resource managers or staff members with a role in a policy or planning unit that focuses on workforce planning.

Unit of Competency	Performance Criteria
CU-1. Identify workforce	<p>P1: Review current data on staff turnover and demographics</p> <p>P2: Assess factors that may affect workforce supply</p> <p>P3: Develop organization's requirement for skilled workforce</p>
CU-2. Develop workforce objectives and strategies	<p>P1: Review organizational strategy and establish aligned objectives for modification</p> <p>P2: Prepare strategies to address unacceptable staff turnover, if required</p> <p>P3: Define objectives to retain required skilled labor</p> <p>P4: Define objectives for workforce diversity and cross-cultural management</p> <p>P5: Obtain agreement and endorsement for objectives and establish targets</p> <p>P6: Develop contingency plans to cope with extreme situations</p>
CU-3. Implement initiatives to support workforce planning objectives	<p>P1: Implement action to support agreed objectives for recruitment, training, redeployment and redundancy</p> <p>P2: P2. Develop and implement strategies to assist workforce to deal with organizational dynamics</p> <p>P1: Implement succession planning model to ensure desirable workers are developed and retained</p> <p>P2: Implement programs to ensure workplace is an employer of choice</p>
CU-4. Monitor and evaluate workforce trends	<p>P1: Evaluate workforce plan against patterns in exiting employee and workforce changes</p>

	<p>P2: Monitor labor supply trends for areas of high turnover in external environment</p> <p>P3: Monitor effects of labor trends on demand for labor</p> <p>P4: Survey organizational climate to gauge worker satisfaction</p> <p>P5: Refine objectives and strategies in response to national and international changes and make recommendations in response to global trends.</p> <p>P6: Regularly review government policy on labor jobs according to labor rights.</p> <p>P7: Evaluate effectiveness of change processes against agreed objectives</p>
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Explain current information about external labor supply relevant to the specific industry or skill requirements of the organization
- K2:** Outline industrial relations relevant to the specific industry
- K3:** Describe labor force analysis and forecasting skills

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in department must be able to provide evidence of the ability to manage workforce planning. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to

1. review and interpret information from a range of internal and external sources to identify:
 - current staff turnover and demographics
 - labor supply trends factors that may affect workforce supply
 - organization's workforce requirements objectives and strategies
2. manage workforce planning including developing, implementing, monitoring and reviewing strategies to meet workforce needs

3. review relevant trends and supply and demand factors that will impact on an organization's workforce
4. Develop a workforce plan that includes relevant research and specific strategies to ensure access to a skilled and diverse workforce.

0619I&CT53. Undertake Project Work

Overview:

This unit describes the skills and knowledge required to undertake a straightforward project or a section of a larger project. It covers developing a project plan, administering and monitoring the project, finalizing the project and reviewing the project to identify lessons learned for application to future projects. This unit applies to individuals who play a significant role in ensuring a project meets timelines, quality standards, budgetary limits and other requirements set for the project.

Unit of Competency	Performance Criteria
CU-1. Define project	<p>P1: Assess project scope and other relevant documentation</p> <p>P2: Identify project stakeholders</p> <p>P3: Seek clarification of discrepancies from delegating authority related to project and project parameters</p> <p>P4: Determine and access available resources to undertake project</p> <p>P5:</p>
CU-2. Develop project plan	<p>P1:. Develop project feasibility report</p> <p>P2: Develop project plan in line with the project parameters</p> <p>P3: Develop and approve project budget</p> <p>P4:P4. Formulate risk management plan for project, including Workplace Health and Safety (WHS)</p>
CU-3. Administer and monitor project	<p>P1: Ensure project team members are clear about their responsibilities and the project requirements</p> <p>P2: Ensure outcomes and documented time lines of the project are met</p> <p>P3: Maintain required recordkeeping systems throughout the project</p> <p>P4: Implement and monitor plans of project finances and resources Prepare project progress reports as required to stakeholders</p> <p>P5: Monitor risk management as required to ensure project outcomes are met</p>
CU-4. Finalize the project	P1: Complete financial recordkeeping associated with project for

	<p style="text-align: center;">audit</p> <p>P2: Maintain proper record of unused items during project</p> <p>P3: Complete project documentation and obtain necessary sign-offs for concluding project</p>
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Give examples of project management tools and how they contribute to a project
- K2:** Outline types of documents and other sources of information commonly used in defining the parameters of a project
- Explain processes for identifying and managing risk in a project
 - Explain the organization's procedures and processes that are relevant to managing a project including:
 - lines of authority and approvals
 - quality assurance
 - human resources
 - budgets and finance
 - recordkeeping
 - reporting
- K3:** Outline the legislative and regulatory context of the organization in relation to project work, including workplace health and safety (WHS) requirements.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to undertake project work. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to:

5. Define the parameters of the project including:
 - Project scope
 - Project stakeholders

- Relationship of project to organizational objectives
 - Reporting requirements
 - Resource requirements
6. Use project management tools to develop and implement a project plan including:
 - Deliverables
 - Work breakdown
 - Budget and allocation of resources
 - Timelines
 - Risk management
 - Recordkeeping and reporting
 7. consult and communicate with relevant stakeholders to generate input and engagement in planning, implementing and reviewing the project
 8. Provide support to team members to enable them to achieve deliverables and to transition them as appropriate at completion of the project
 9. Finalize the project including documentation and reporting
 10. Review and document the project outcomes

0619I&CT54. Identify and Communicate Trends in Career Development

Overview:

This unit describes the skills and knowledge required to conduct research to identify and communicate career trends. It establishes the need to interact professionally with others in assessing career needs, to effectively assist clients identify competencies they require for a career and employability in a given context. It also examines how to maintain quality of career development services and professional practice. It applies to individuals seeking to identify and communicate trends in career development.

Unit of Competency	Performance Criteria
CU-5. Perform Research and explore career trends	<p>P1. Apply knowledge of changing organizational structures, lifespan of careers and methods of conducting work search, recruitment and selection processes</p> <p>P2. Analyze changing worker and employer issues, rights and responsibilities in context of changing work practices</p> <p>P3. Examine importance of quality careers development services</p> <p>P4. Maintain all research, documentation, sources and references (digital or physical).</p> <p>P5. Analyze implications of relevant policy, legislation, professional codes of practice and national standards relating to worker and employer issues</p> <p>P6. Confirm cluster employability skills and preferences that may open employment options in other career pathways</p>
CU-6. Assess and confirm ongoing career development	<p>P1. Assess success of previous career development services</p> <p>P2. Maintain privacy and security of all data, research and personal records according to relevant policy</p> <p>P3. Establish existing work-life balance and friendly environment</p>
CU-7. Maintain quality of career development services and professional practice	<p>P1. Analyze and review relevance of career theories, models, frameworks and SOPs</p> <p>P2. Incorporate into career development services and professional practice</p> <p>P3. Comply with all relevant policies</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Diversity and its potential effects on career choices
- K2:** Outline human psychological development and needs in relation to career development
- K3:** Outline relevant policy, legislation, codes of practice and standards relevant to career development
- K4:** Explain recruitment and selection processes in the context of career development services
- K5:** Describe a range of data gathering and research techniques
- K6:** Explain techniques used to analyze trends.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to identify and communicate trends in career development. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to:

1. research and analyze current economic, labor market, employment, career and vocational educational and training trends
2. identify choices and career development needs for individuals within a given context
3. report and document management of research and career development materials
4. Comply with all relevant local, state/territory and national legislation, policies and practices.

0619I&CT55.Apply Interpersonal Skills

Overview:

This unit describes the skills and knowledge required to use advanced and specialized communication skills in the client-counselor relationship. This unit applies to individuals whose job role involves working with clients on personal and psychological issues within established policies, procedures and guidelines.

Unit of Competency	Performance Criteria
CU-1. Communicate effectively	P1: Identify communication barriers and use strategies to overcome these barriers in the client-counselor relationship P2: Facilitate the client-counselor relationship through selection and use of micro skills P3: Observe and respond to non-verbal communication cues P4: Integrate case note taking with minimum distraction
CU-2. Use specialized counseling interviewing skills	P1: Select and use communication skills according to the sequence of a counseling interview P2: Identify points at which specialized counseling interviewing skills are appropriate for inclusion P3: Use specialized counseling communication techniques based on their impacts and potential to enhance client development and growth P4: Identify and respond appropriately to strong client emotional reactions
CU-3. Evaluate own communication	P1: Reflect on and evaluate own communication with clients P2: Recognize the effect of own values and beliefs on communication with clients P3: Identify and respond to the need for development of own skills and knowledge

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: Legal and ethical considerations for communication in counseling practice, and how these are applied in individual practice:

- Codes of conduct/practice
- Discrimination
- Human rights
- Practitioner/client boundaries
- Privacy, confidentiality and disclosure
- Rights and responsibilities of workers, employers and clients
- Work role boundaries responsibilities and limitations of the counselor role
- Workplace health and safety

K2: Communication techniques and micro-skills including:

- Attending behaviors active listening, reflection of content feeling, summarizing
- Questioning skills open, closed, simple and compound questions
- Client observation skills
- Noting and reflecting skills
- Providing client feedback

K3: Components of the communication process including:

- Encoder
- Decoder

K4: Primary factors that impact on the communication process including:

- Context
- Participants
- Rules
- Messages
- Channels
- Noise
- Feedback

K5: Communication barriers and resolution strategies, including:

- Environmental
- Physical
- Individual perceptions

- Cultural issues
- Language
- Age issues
- Disability

K6: Observational techniques including:

- Facial expressions
- Non-verbal behavior
- Posture
- Silence

K7: Ways including:

- Visual in which different people absorb information
- Auditory
- Kinesthetic

K8: Impacts of trauma and stress on the communication process, including on:

- Concentration and attention
- Memory
- Intelligence
- Use of verbal and written language
- Use of body language
- Challenging within the counseling session

K9: Self-evaluation practices, including:

- How to recognize own biases
- Impact of own values on the counseling relationship.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to apply specialist interpersonal and counseling interview skills. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Demonstrated evidence is required of the ability to:

1. Interviewed at least 3 different clients using specialized interpersonal communication and counseling interviewing skills, including:
2. Micro-skills and communication techniques, including:
3. Attending behaviors active listening,

4. Reflection of content, summarizing
5. Questioning skills open, closed, simple and compound questions
6. Client observation skills
7. Noting and reflecting skills
8. Providing client feedback
9. Specialized counseling interviewing skills, including:
 10. Challenging
 11. Reframing
 12. Focusing
13. Integrated clear case note taking into the interview process
14. Completed a structured process of self-reflection and evaluation of own communication used during the 3 interviews.

0619I&CT56.Work Safely in an Office Environment

Overview:

This unit describes the performance outcomes, skills and knowledge required to participate in workplace occupational health and safety (OHS) processes to protect workers own health and safety, and that of others.

Unit of Competency	Performance Criteria
CU-1. Implement Work safety	P1: Follow established safety procedures when conducting work P2: Carry out pre-start systems and equipment checks in accordance with workplace procedures P3: accordance with workplace procedures
CU-2. Implement workplace safety requirements	P1: Identify designated persons for reporting queries and concerns about safety in the workplace P2: Identify existing and potential hazards in the workplace, report them to designated persons and record them in accordance with workplace procedures P3: Identify and implement workplace procedures and work instructions for controlling risks P4: Report emergency incidents and injuries to designated persons P5: Maintain emergency contact list
CU-3. Participate in OHS consultative processes	P1: Contribute to workplace meetings, inspections or other consultative activities P2: Raise OHS issues with designated persons in accordance with organizational procedures P3: Take actions to eliminate workplace hazards or to reduce risks
CU-4. Follow safety procedures	P1: Identify and report emergency incidents P2: Follow organizational procedures for responding to emergency incidents P3: Inspect all safety tools regularly.

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Explain responsibilities of employers and employees under relevant health and safety regulation
- K2:** Describe emergency procedures including procedures for fires, accidents and evacuation
- K3:** Outline commonly used hazard signs and safety symbols.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to participate in workplace OHS processes. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Assessment must ensure the safety processes; hazards and risk are relevant to the area of work. Evidence of the following is essential:

1. Accurately follow all relevant safety procedures
2. Identify and report hazards to designated personnel
3. Knowledge of relevant health and safety regulations
4. Knowledge of relevant materials, equipment and work processes.

0619I&CT57.Develop Workplace Documents

Overview:

This unit covers interpreting and composing a range of workplace documents from a number of sources. It includes interpreting written information for workplace purposes as well as planning, drafting and reviewing a basic document before writing the final version. The focus is on the content and structure of written materials and not on the use of computer technology

Unit of Competency	Performance Criteria
CU-1. Interpret written information	<p>P1:Read workplace materials to identify the subject and key information for using or reporting to others.</p> <p>P2:Read procedural manuals and codes of practice to locate specific information to carry out work functions in accordance with policy and standards.</p> <p>P3:Read a range of written materials to locate and select required information for summaries, short reports and response to requests.</p> <p>P4:Identify the cultural context and prior knowledge required to interpret workplace information and obtain assistance when required.</p> <p>P5:Determine candidate and purpose for the document</p> <p>P6:Seek assistance with interpretation of complex materials in accordance with organizational procedures.</p>
CU-2. Develop written materials	<p>P1:Identify and comply with established requirements for a range of written materials</p> <p>P2:Determine format and structure</p> <p>P3:Identify organizational requirements</p> <p>P4:Establish method of communication</p> <p>P5:Develop introductory guide for incumbents</p>
CU-3. Draft document	<p>P6:Develop draft document to communicate key points</p> <p>P7:Obtain and include any required additional information</p>
CU-4. Review document	<p>P1:Check draft for suitability of tone for audience, purpose, format and communication style</p> <p>P2:Check draft for readability, grammar, spelling, sentence and</p>

	<p>paragraph construction and correct any inaccuracies or gaps in content.</p> <p>P3: Check draft for sequencing and structure</p> <p>P4: Check draft to ensure it meets organizational requirements</p> <p>P5: Ensure draft is proofread, where appropriate, by supervisor or colleague</p>
CU-5. Write final document	<p>P1: Make and proofread necessary changes</p> <p>P2: Ensure document is sent to intended recipient within required time frames</p> <p>P3: File copy of document in accordance with organizational policies and procedures</p>

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K1:** Reading and writing procedures at a level to cope with a range of workplace materials
- K2:** Integration of information from a number of sources in order to generate meaning
- K3:** Ways to write and sequence paragraphs according to the required purpose of written material
- K4:** Outline the linking ideas in written material through selection and use of words, grammatical structures, headings and punctuation appropriate to the purpose
- K5:** Spelling, punctuation and grammar for workplace documents at an experienced level
- K6:** Response to diversity, including gender and disability
- K7:** Implementation of ergonomic requirements for office work
- K8:** Environmental policies such as those relating to paper use/wastage/recycling
- K9:** Preparation of general information and papers according to target audience
- K10:** Problem solving skills to determine document design and production processes
- K11:** Usage of resources to assist in document production, such as dictionary, thesaurus, templates, style sheets
- K12:** Ways to produce business letters, memos, job applications, resumes, meeting agendas and minutes
- K13:** Ways to handle courier/postal services

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to interpret written information for workplace purposes and plan, draft and review a basic document before writing the final version. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Evidence of the following is essential:

1. Producing a range of documents that accurately convey required information including single and multipage business letters, memos, job applications, resumes, meeting agendas and minutes.
2. Knowledge of organizational policies and procedures for document production

0619I&CT58. Maintain Professionalism in Workplace

Overview:

This unit of competency describes the outcomes required maintain a professional image in the workplace, including behaving ethically, demonstrating motivation, respecting timeframes and maintaining personal appearance.

Unit of Competency	Performance Criteria
<p>CU-1. Respect work timeframes</p>	<p>P1: Demonstrate punctuality in meeting, set working hours and times.</p> <p>P2: Utilize working hours only for working and follow company regulations.</p> <p>P3: Complete work tasks within deadlines according to order of priority</p> <p>P4: Perform extra ordinary during working hours</p>
<p>CU-2. Maintain personal appearance and hygiene</p>	<p>P1: Clean hair, body and nails regularly.</p> <p>P2: Wear suitable cloths for the workplace, and respect local and cultural contexts</p> <p>P3: Meet specific company dress code requirements</p> <p>P4: Keep smiling and have positive body language during working hours</p>
<p>CU-3. Maintain adequate distance with colleagues and clients</p>	<p>P1: Respect personal space of colleagues and clients with reference to local customs and cultural contexts.</p> <p>P2: Avoid cross transmission of infections (especially through respiration).</p>
<p>CU-4. Work in an ethical manner</p>	<p>P1: Follow company values/ethics codes of ethics and/or conduct, policies and guidelines.</p> <p>P2: Use company resources in accordance with company ethical standards.</p> <p>P3: Undertake work practices in compliance with company ethical standards, organizational policy and guidelines.</p> <p>P4: Instruct co-workers on ethical, lawful and reasonable directives.</p>

	<p>P5: Share company values/practices with co-workers using appropriate behavior and language.</p> <p>P6: Report work incidents/situations and/or resolved in accordance with company protocol/guidelines.</p>
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Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

- K14:** Application of good manners and right conduct
- K15:** Basic practices for oral and personal hygiene
- K16:** Common products used for oral and personal hygiene
- K17:** Outline the company code of conduct/values
- K18:** Outline the Company regulations, performance and ethical standards
- K19:** Work responsibilities/job functions
- K20:** Communication skills
- K21:** Workplace hygiene standards

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A candidate who demonstrates competency in this unit must be able to provide evidence of the ability to maintain professionalism in the workplace. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Evidence of the following is essential:

1. Clarify and affirm work values/ethics/concepts consistently in the workplace;
2. Comply with required working times;
3. Conduct work practices satisfactorily and consistently, in compliance with work ethical standards, organizational policy and guidelines;
4. Keep adequate distance while interacting with colleagues and clients.

Islamabad 3rd September, 2019

NOTIFICATION

No. F. 5(13)/2018-DD (TE): In pursuance of sub-section (d) of section-6" Functions of the Commission" National Vocational & Technical Training Commission (NAVTTTC) Act-2011, NAVTTTC is pleased to approve and notify following qualifications in seven (07) trades for Level 1-5 under National Vocational Qualification Framework (NVQF), which have been developed in compatibility with latest global trends in the fields and fulfilling requirements of competency based training and assessment (CBT&A) system. The qualifications have been developed and validated in collaboration with TEVTAs, QABs, industry and other relevant stakeholders: -

S#	National Vocational Qualifications
1.	National Qualification Level-5 diploma in Artificial Intelligence
2.	National Qualification Level-5 diploma in Robotics Technology
3.	National Qualification Level-5 diploma in Automation & Process Control
4.	National Qualification Level-5 diploma in Mechatronics Technology
5.	National Qualification Level-5 diploma in Water Quality & Resource Management
6.	National Qualification Level-5 diploma in Retail and Merchandize Management
7.	National Qualification Level-5 diploma in Printing & Publishing Technology

2. All the TVET related institutions / organizations are required to implement aforementioned qualifications so that a uniform and standardized TVET qualification system is established in Pakistan and efforts are made for international equivalence / recognition of these qualifications.

3. Competency Standards of the above-enlisted qualifications can be accessed at NAVTTTC's website (www.navttc.org).



(Muqem Islam)

Director General (Skill Standards & Curricula)

Distribution:

1. Federal Secretary, Ministry of Federal Education & Professional Training, Govt of Pakistan
2. Federal Secretary, Ministry of Overseas Pakistanis and Human Resource Development, Govt of Pakistan, Islamabad
3. Federal Secretary, Ministry of Industry and Production, Govt of Pakistan, Islamabad
4. Federal Secretary, Ministry of Textile Industry, Govt of Pakistan, Islamabad
5. Federal Secretary, Ministry of Commerce, Govt of Pakistan, Islamabad
6. Federal Secretary, Ministry of Railway, Govt of Pakistan, Islamabad
7. Federal Secretary, Ministry of Climate Change, Govt of Pakistan, Islamabad
8. Federal Secretary, Ministry of Religious Affairs, Govt of Pakistan, Islamabad
9. Federal Secretary, Ministry of Communication, Govt of Pakistan, Islamabad
10. Federal Secretary, Ministry of Aviation Division, Govt of Pakistan, Islamabad
11. Federal Secretary, Ministry of Science & Technology, Govt of Pakistan, Islamabad
12. Chairperson, Punjab Technical Education and Vocational Training Authority (P-TEVTA), Lahore
13. Managing Director, Khyber Pakhtunkhwa Technical Education and Vocational Training Authority (KP-TEVTA),
14. Managing Director, Sindh Technical Education and Vocational Training Authority (S-TEVTA), Karachi
15. Chairman, Azad Jammu & Kashmir, Technical Education and Vocational Training Authority (AJ&K TEVTA), Muzafarabad
16. Director TVET Cell, Gilgit Baltistan, Gilgit
17. Director General, Punjab Vocational Training Council (PVTC), Punjab
18. Managing Director, Technology Upgradation and Skill Development Company (TUSDEC) Lahore
19. Project Director, Punjab Skill Development Program (PS DP) Lahore
20. CEO, Punjab Skill Development Fund, Lahore
21. Rector, UNTECH University Islamabad
22. National Deputy Leader, GIZ Islamabad
23. PS to Minister of Federal Education & Professional Training, Govt of Pakistan
24. PS to Special Adviser to the Prime Minister on Youth Affairs, Prime Minister's Office, Islamabad
25. Chairperson, Federal of Pakistan Chamber of Commerce and Industry (FPCCI), Karachi
26. Conveyor, Sector Skills Council (Textile/ Construction/ Renewable Energy/ Hospitality and Tourism)

27. Director Technical Education and Vocational Training Authorities (TEVTA), Balochistan
28. Chairman, Pakistan Tourism Development Corporation, Lahore
29. Chairman, PCSIR Headquarters, Islamabad
30. Director General, Pakistan Forest Institute, Peshawar
31. Chairman, Wafaq ul Madaris, Multan
32. Director General, Staff Welfare, Islamabad
33. Director General, NISTE Capital Administration and Development Division, Islamabad
34. Director General, National Training Bureau, Islamabad
35. Chairmen, Provincial Technical Education Boards
36. Chairmen, Provincial Trade Testing Boards
37. Director General, Federal Directorate of Education Islamabad
38. Secretary, IBCC, Islamabad: *with the request that National qualifications of Level 5 diploma in the aforementioned trades may be considered equivalent to Diploma of Associate Engineer/HSSC after inclusion of compulsory courses in the light of IBCC general requirement.*

Copy for information to: -

1. DG (P&D)/(A&F)/ (A&C) (S&C) NAVTTC
2. Director General(s), NAVTTC Regional Office(s).
3. Sr. Technical Advisor, TSSP-GIZ
4. Staff Officer to Chairman, NAVTTC
5. PS to Executive Director, NAVTTC Islamabad
6. Concerned File/ Office Copy