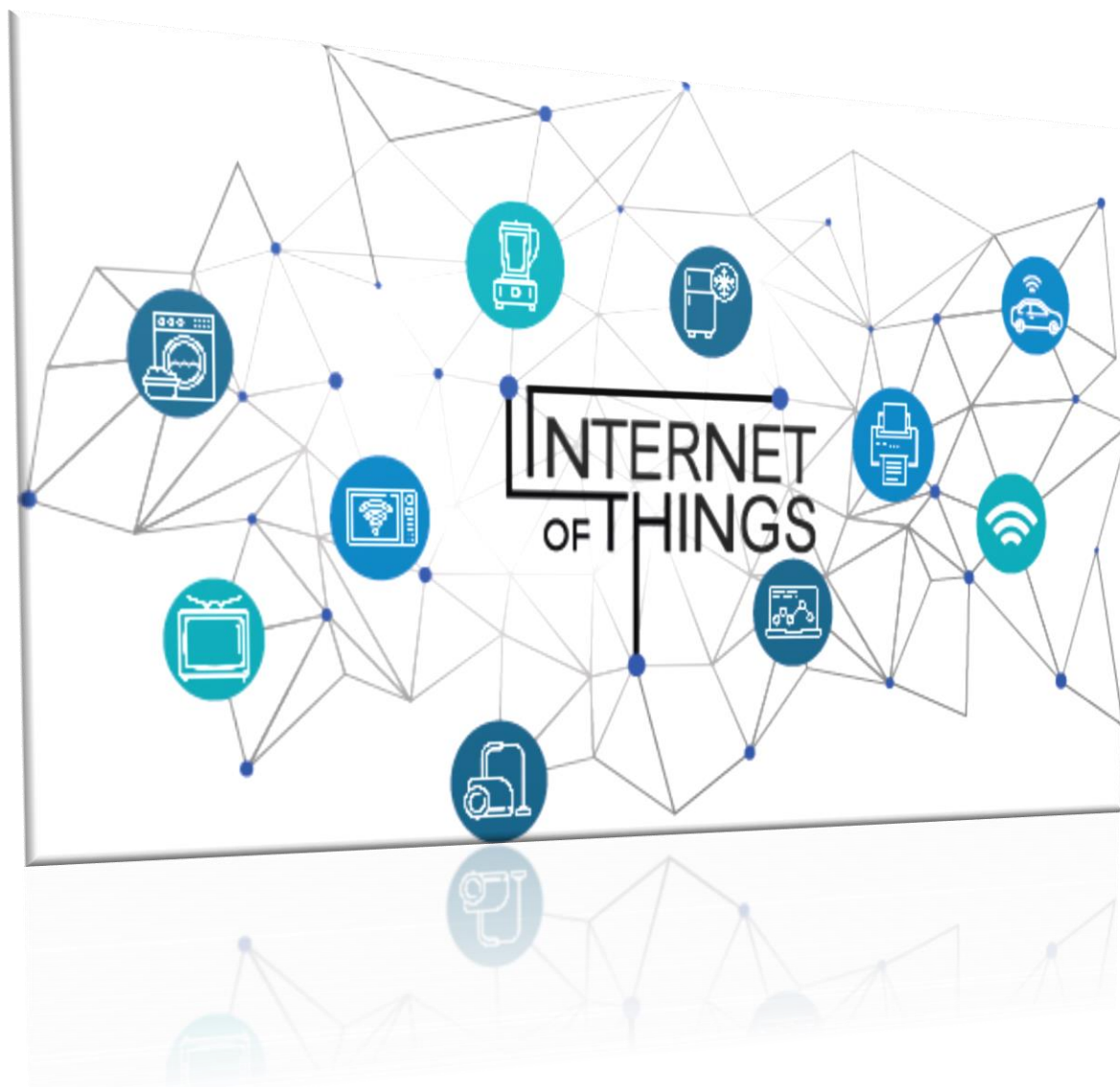




## **National Competency Standards for “Internet of Things (IoT)”**



**National Vocational and Technical Training Commission (NAVTTTC),  
Government of Pakistan**



## **ACKNOWLEDGEMENT**

National Vocational and Technical Training Commission (NAVTTTC) extends its gratitude and appreciation to representatives of business, industry, academia, government agencies, provincial TEVTAs, sector skill councils and trade associations who spared time and extended their expertise for the development of National Vocational Qualifications for the trade of **Internet of Things (IoT)**. This work would not have been possible without the technical support of the above personnel.

NAVTTTC initiated development of CBT&A based qualifications for 200 traditional / hi-tech trades under the Prime **Minister’s Hunarmand Pakistan Program**, focusing on Development & Standardization of 200 Technical & Vocational Education & Training (TVET) Qualifications. NAVTTTC efforts have received full support from the Ministry of Federal Education and Professional Training which highly facilitated progress under this initiative.

It may not be out of place to mention here that all the experts of Industry, Academia and TVET experts of TEVTAs, BTEs and PVTC work diligently for making this qualification worthy and error free for which all credit goes to them. However, NAVTTTC accepts the responsibility of all the errors and omissions still prevailing in the Qualification document.

It is also noteworthy that development of Skill Standards is a dynamic and ongoing process, and the developed skill standards needs periodic review and updating owing to the constant technological advancements, development in scientific knowledge, and growing experience of implementation at the grass root level as well as the demand of industry. NAVTTTC will ensure to keep the qualifications abreast with the changing demands of both national and international job markets.

**Dr. Nasir Khan,  
Executive Director,  
NAVTTTC**



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## **1. Introduction**

The Internet of Things (IoT) is a network of resource constrained nodes being capable of automating an existing manual procedure. This IoT network is also connected to the internet to enable ease of access and user friendly configuration and monitoring. An IoT developer is an expert who completely understands the IoT network, its different components and their working. IoT developer is capable of programming sensor and hardware devices. IoT developer is capable of developing a hardware and software for IoT edge devices. He is also trained of sending the data to the cloud server. IoT developer is a specialist in utilizing resource constrained devices. IoT cloud developer is an expert who can install and configure Virtual machines on the cloud. While IoT Data scientist is the one who utilizes the data received on the cloud and saves it efficiently in the databases to train Machine Learning algorithms. IoT security is one of the hot research topic nowadays which will create many skill based jobs in the near future. An IoT developer is incomplete without the understanding and hands on experience of security protocols. In a nutshell, IoT is the start of art technology to automate the industrial, commercial and domestic procedures and there is a need to develop the resources with the required IoT skills which will not only benefit the industry but also create job opportunities for the individuals.

IoT is an ever changing field. The number of IoT nodes are increasing each day and hence their monitoring, upgrading and security needs. Therefore, industry requirement for skilled workforce is increasing which can only be managed through setting relevant competency standards in collaboration with the leading industries.

Being cognizant of this fact, National Vocational & Technical Training Commission (NAVTTTC) developed competency standards for IoT system development under National Vocational Qualifications Framework (NVQF). These competency standards have been developed by a Qualifications Development Committee (QDC) and validated by the Qualifications Validation Committee (QVC) having representation from the leading IoT development houses and research labs of the country.



## **2. Purpose of the Qualification**

The competency based NVQ has been developed to train the unskilled men and women of Pakistan on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by enhancing their livelihood income.

The purpose of these qualifications is to set highly professional standards for IoT Experts in order to complete local and international job market. Who will serve as key elements enhancing quality of Pakistan’s IoT development sector. The specific objectives of developing these qualifications are as under:

- Improve the professional competence of IoT Hardware and Software development
- Capacitate the local community and trainers in modern CBT trainings, methodologies and processes as envisaged under NVQF
- Provide flexible pathways and progressions in IoT development houses
- Enable the trainees to perform their duties in efficient manner
- Establish a standardized and sustainable system of training in IoT industry in Pakistan
- Enabling the youth with greater employment opportunities



### 3. Date of Validation

The level 5 IoT qualification has been validated on 20<sup>th</sup> – 24<sup>th</sup> July 2020 at PITAC, Lahore, by the qualification validation committee (QVC) members.

### 4. Date of Review

The level 5 IoT qualification has been reviewed on \_\_\_\_\_, by the qualification validation committee (QVC) members.

### 5. Codes of Qualifications

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 follows:

ISCED Classification	
Code	Description
0714-E&A(1)	1 <sup>st</sup> Level National Certificate of level-5, in “ Internet of Things”
0714-E&A(2)	2 <sup>nd</sup> Level National Certificate of level-5, in “ Internet of Things”
0714-E&A(3)	3 <sup>rd</sup> Level National Certificate of level-5, in “ Internet of Things”
0714-E&A(4)	4 <sup>th</sup> Level National Certificate of level-5, in “ Internet of Things”



## 6. Members of Qualification Development Committee

The following members participated in the qualification development process of the IoT qualification at PITAC, Lahore.

**Date:**08 to 12 June 2020

S#	Name	Designation
1.	Dr. Adnan Noor Mian	Associate Professor – ITU, Lahore
2.	Ali Hammad	Associate Professor – UET, Lahore
3.	Sanaullah Manzoor	Research Associate & PHD Fellow – ITU, Lahore
4.	Muhammad Anghus Jamil	Managing Partner – Techno Desert
5.	Mughees Butt	Co-founder – Techno Desert
6.	Salman Shahid	Embedded Developer – Techno Desert
7.	Amir Amin	HOD – City Polytechnic
8.	Muhammad Umair	Lecturer, UET Lahore
9.	Hina Khalid	Assistant Professor – UET, Lahore
10.	Muhammad Yasir	Deputy Director - NAVTTC
11.	Muhammad Hassaan	Daccum Facilitator / BCS



## 7. Members of Qualification Validation Committee

The following members participated in the qualification validation process of **IoT** at PITAC, Lahore.

**Date:** 20<sup>th</sup> -24<sup>th</sup> July, 2020

S#	Name	Designation
1.	Dr. Ahmad Mustafa	Chief Instructor, GSTC, Murree
2.	M. Abbas Khan Abbasi	HOD, KP Tevta, GPI, Mansehra
3.	Hina Khalid	Assistant Professor, UET, Lahore
4.	Danish Khan	Calibration & Testing Engineer, PCSIR, Islamabad
5.	Muzammil Hassan	AM Research, KICS-UET, Lahore
6.	Muhammad Umair	Lecturer, UET, Lahore
7.	Sanaullah Manzoor	Research Associate, PHD Fellow, ITU, Lahore
8.	Faisal Sarwar	PBTE Representative
9.	Muhammad Nouman	
10.	Muhammad Yasir	Deputy Director, NAVTTC
11.	Muhammad Hassaan	Daccum Facilitator





## **8. Entry Requirements**

The entry requirement for this qualification would be Matric with science and Level 4 certificate in IoT.

## **9. Regulation of the Qualification and Schedule Of Units**

Not Applicable



## 10. Summary of Competency Standards

Sr No	Competency Standards	Occupation	NVQF Level	Category	Estimated Contact Hours			Cr Hr
					Th	Pr	Total	
<b><u>Level 5</u></b> <b><u>IoT Associate Engineer</u></b>								
1	Interface long range wireless technologies ( Lora, NB IoT, MTC) with Microcontroller		Level 5	Technical	22	24	46	4.6
2	Apply MQTT, CoAP, HTTP on IoT nodes		Level 5	Technical	15	18	33	3.3
3	Configure IoT gateways (Wi-Fi/Lora/NB-IoT)		Level 5	Technical	23	27	50	5
4	Install/ Configure Android Studio		Level 5	Technical	19	27	46	4.6
5	Build Mobile Application		Level 5	Technical	25	57	82	8.2
6	Build Robust UI for greater UX (user experience)		Level 5	Technical	19	27	46	4.6
7	Test, Debug and use support libraries		Level 5	Technical	22	30	52	5.2
8	Program/use background android application with database		Level 5	Technical	33	45	78	7.8
9	Save user data/integrate android application with database		Level 5	Technical	29	51	80	8
10	Setup cloud server		Level 5	Technical	29	51	80	8
11	Develop Program in Python		Level 5	Technical	19	33	52	5.2
12	Deploy hardware protection		Level 5	Technical	15	45	60	6
13	Perform software protection		Level 5	Technical	19	18	37	3.7
14	Implement cryptography and network security		Level 5	Technical	18	42	60	6
15	Manage and Supervise the job activities		Level 5	Generic	20	12	32	3.2



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16	Develop entrepreneurial skills		Level 5	Generic	20	12	32	3.2
17	Practice Professionalism		Level 5	Generic	10	15	25	2.5
18	Create/Manage profile on Non-traditional Freelancing Platforms		Level 5	Generic	10	6	16	1.6
19	Write proposals for freelancing projects		Level 5	Generic	100	200	300	30
Total					480	720	1200	120



## 11. Detail of Qualification and its Competency Standards

### LEVEL 5: IOT ASSOCIATE ENGINEER

#### 0714-E&A-1. Interface long range wireless technologies (LoRa, NB IoT, MTC) with Micro-controller

**Overview:** This competency unit covers the skills and required knowledge to use different Short-Range Wireless Technologies such as (LoRa, NB IoT, MTC). This competency unite also covers the tools required to execute the performance criterion.

Competency Unit	Performance Criteria
<b>CU1. Use LoRa with Micro-controller</b>	<p><b>P1:</b>Download datasheet</p> <p><b>P2:</b>Select pin configuration and interfacing protocol</p> <p><b>P3:</b>Install the required library on IDE</p> <p><b>P4:</b>Configure LoRa settings</p> <p><b>P5:</b>Establish LoRa communication between two different modules</p> <p><b>P6:</b>Transmit and receive application data</p> <p><b>P7:</b>Rectify the issues in connectivity of the device</p>
<b>CU2. Use NB IoT with Micro-controller</b>	<p><b>P1:</b>Select pin configuration and communication interface from datasheet</p> <p><b>P2:</b>Setup NB-IoT and access point</p> <p><b>P3:</b>Open a UDP socket in another compatible mobile</p> <p><b>P4:</b>Transmit and receive application data</p> <p><b>P5:</b>Rectify the issues in connectivity of the device</p>
<b>CU3. Identify and use MTC (Cellular 4G networks)</b>	<p><b>P1:</b>Make hardware connections of the LTE module with Raspberry Pi</p> <p><b>P2:</b>Install any required software and configure settings</p> <p><b>P3:</b>Setup network interface</p> <p><b>P4:</b>Establish communication between two different modules</p> <p><b>P5:</b>Transmit and receive application data</p> <p><b>P6:</b>Rectify the issues in connectivity of the device</p>

#### Knowledge & Understanding

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



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- Knows basics of wireless communication and various protocols for wireless communication.
- Understanding of network topologies: Star, mesh and hybrid networks
- Able to identify infrastructure-based and ad-hoc networks
- Able to identify different components of a network
- Basic understanding of the Short-range protocols
- Basic understanding of the LoRa, NB IoT and cellular protocols
- I/O interfacing and microcontroller programming
- Understanding of network topologies: Start, mesh, bus, ring and hybrid networks
- Knowledge of socket communication
- Able to identify infrastructure and adhoc networks
- Able to identify different components of a network
- Basic understanding of the Long range technologies
- I/O interfacing and microcontroller programming
- Microcontrollers
- Knowledge of LoRa
- Able to choose the best topology as per the application
- Able to understand components and communication protocols of WSNs
- I/O interfacing and microcontroller programming
- Able to choose the best network topology as per the application requirements

### **Tools and Equipment**

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

S. No.	Items
1	Microcontroller - Arduino
2	Jumper wires
3	Built-in software libraries for communication
4	Datasheets
5	Power Supply
6	DMM for testing hardware connections
7	Laptop
8	Working internet connection
9	Temperature sensor
10	LoRa Module
11	Microcontroller – Arduino
12	NB-IoT Module
13	MTC Module
14	Raspberry pi
15	IoT Devices

### **Critical Evidence(s) Required**

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

- Establish communication between two devices for each of the wireless technologies (LoRa, NB IoT and MTC)



## 0714-E&A-2. Apply MQTT, CoAP, HTTP on IoT nodes

**Overview:** This competency unit covers the skills and required knowledge to apply MQTT, CoAP, HTTP as per requirement with IoT Vision. This competency unit also covers the tools required to execute the performance criterion.

Competency Unit	Performance Criteria
<b>CU1. Apply MQTT on IoT nodes</b>	<b>P1:</b> Establish MQTT Client <b>P2:</b> Establish MQTT broker <b>P3:</b> Use MQTT built-in libraries for MQTT communication in application codes <b>P4:</b> Send and receive data using publish subscribe paradigm
<b>CU2. Apply CoAP on IoT nodes</b>	<b>P1:</b> Set up CoAP client <b>P2:</b> Set up CoAP server <b>P3:</b> Establish intercommunication of CoAP server with client
<b>CU3. CU3. Apply HTTP on IoT nodes</b>	<b>P1:</b> Use HTTP GET method to receive data <b>P2:</b> Use HTTP POST method to send data <b>P3:</b> Use HTTP CONNECT method for TCP connections

### Knowledge & Understanding

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

- Basic understanding of the IoT application protocols
- Basic networking concepts
- Basic understanding of the, MQTT, LoRa, CoAP, HTTP, NB IoT and cellular protocols
- I/O interfacing and microcontroller programming
- Understanding of network topologies: Star, mesh, bus, ring and hybrid networks
- Able to identify infrastructure and adhoc networks
- Able to identify different components of a network
- Basic understanding of the application layer protocols
- I/O interfacing and microcontroller programming
- Microcontrollers
- Differentiate different message types (Confirmable, Non- Confirmable, Acknowledgment, Reset)
- Able to choose the best topology as per the application
- Able to understand components and communication protocols of WSNs



### **Tools and Equipment**

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

S. No.	Items
1	Raspberry Pi
2	NodeMCU
3	Arduino
4	Wi-Fi Shield for internet connectivity of Arduino
5	Software Libraries
6	Laptop
7	Working internet connection

### **Critical Evidence(s) Required**

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

- Establish MQTT/CoAP/HTTP communication b/w two devices



### 0714-E&A-3. Configure IoT gateways (Wi-Fi/LoRa/NB-IoT)

**Overview:** This competency unit covers the skills and required knowledge for the configuration of IoT gateways (Azure/LoRa/NB-IoT). This competency unit also covers the tools required to execute the performance criterion.

Competency Unit	Performance Criteria
<b>CU1. Configure WiFi-IoT gateways</b>	<b>P1:</b> Setup a Raspberry Pi <b>P2:</b> Install MQTT Broker <b>P3:</b> Run a MQTT C client to read the data from broker. <b>P4:</b> Run another MQTT client to send data to the MQTT broker on the cloud <b>P5:</b> Confirm data receipt on gateway from multiple end nodes
<b>CU2. Configure LoRa Gateway</b>	<b>P1:</b> Run the configuration tool <b>P2:</b> Select required parameters (channels etc.) <b>P3:</b> Test the configuration
<b>CU3. Configure NB-IoT Gateway</b>	<b>P1:</b> Run the configuration tool <b>P2:</b> Select required parameters (channels etc.) <b>P3:</b> Test the configuration

### Knowledge & Understanding

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

- Basic understanding of the IoT application protocols
- Basic networking concepts
- Basic understanding of the LoRa, NB IoT and cellular protocols
- I/O interfacing and microcontroller programming
- Understanding of network topologies: Star, mesh, bus, ring and hybrid networks
- Able to identify infrastructure and adhoc networks
- Able to identify different components of a network
- Basic understanding of the application layer protocols
- I/O interfacing and microcontroller programming
- Microcontrollers
- Able to choose the best topology as per the application
- Able to understand components and communication protocols of WSNs

### Tools and Equipment

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

S. No.	Items
1	LoRa Module
2	Microcontroller – Arduino





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3	NB-IoT Module
4	Jumper wires
5	Built-in software libraries for communication
6	Datasheets
7	Power Supply
8	DMM for testing hardware connections
9	Laptop
10	Working internet connection
11	Raspberry pi
12	Internet

**Critical Evidence(s) Required**

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

- Setup a Gateway for any application (Wi-Fi/LoRa/NB-IoT)



#### 0714-E&A-4. Install/Configure Android Studio

**Overview:** This competency unit covers the skills and required knowledge to install JDK, Android Studio and configure environment variable and Configure Android Studio to setup mobile application development environment.

Competency Unit	Performance Criteria
<b>CU1. Build XML Application</b>	<b>P1:</b> Build XML (eXtensible Markup Language) Application <b>P2:</b> Build XSLT/Schema <b>P3:</b> Build database in XML
<b>CU2. Install /Configure Android Studio</b>	<b>P1:</b> Download any latest version of android studio <b>P2:</b> Install android studio <b>P3:</b> Download/Install required system Images for AVD <b>P4:</b> Configure Android Virtual Device (AVD)

#### Knowledge & Understanding

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

- Describe different versions and API levels of Android.
- Explore and Describe Android API levels
- Explore online developer resources
- How to choose the best API level SDK for development?
- Describe different screen sizes and resolutions.

#### Tools and Equipment

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

S. No.	Items
1.	Computer with minimum 5 <sup>th</sup> generation and 8GB of RAM with SSD
2.	Internet Connection
3.	Web Browser
4.	Search Engines



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5.	Software Development kit
6.	Android Studio
7.	Visual Studio code

### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Install and configure Android Studio properly
- Create Android Virtual Device (AVD) properly/ other emulator for application testing



### 0714-E&A-5. Build Mobile Application

**Overview:** This competency unit covers the skills and required knowledge about the Project structures, the Building blocks of android application, how to create activities, how to create a multi-screen application, what is implicit, explicit intents and how to communicate between activities.

Competency Unit	Performance Criteria
<b>CU1. Build Application using different layouts and UI Components</b>	<b>P1:</b> Create new project <b>P2:</b> Select best suitable API and language <b>P3:</b> Add views in the Constraint Layout editor. <b>P4:</b> Update the UI dynamically depending on user input <b>P5:</b> Update Mobile application layout to perform well in portrait and landscape mode. <b>P6:</b> Run application on emulator <b>P7:</b> Write code in all lifecycle functions and observe the output <b>P8:</b> Debug application using android studio debugger
<b>CU2. Handle Intents</b>	<b>P1:</b> Create new activities and start them by sending an explicit Intents. <b>P2:</b> Start a new activity by sending an implicit intent that looks for an activity to handle the request.
<b>CU3. Create service</b>	<b>P1:</b> Create service in android studio <b>P2:</b> Transfer data between services and activities.
<b>CU4. Configure Gradle</b>	<b>P1.</b> Select Gradle files <b>P2.</b> Add libraries <b>P3.</b> Build an Android app with free and paid product.

### Knowledge & Understanding

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

- Learn how to add interactive UI elements to app and understand the range of UI elements available
- Understand the development process for building Android apps.
- Understand the performance implications of different ways to make content in an app scrollable.
- Understand the ways that developers can learn for themselves.
- Understand how to send an explicit intent to start a specific activity
- Describe about activity lifecycles, intents.
- Describe the functionality of Gradle.
- Describe the functionality of the debugger.
- Describe Setting and muting breakpoints.



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- Describe testing methods.
- How to use support libraries to ensure app is backward compatible with previous versions of Android.

### **Tools and Equipment**

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

S. No.	Items
1.	Recommended Computer System min 5 generation with 8 GB and SSD drive
2.	Internet Connection
3.	Web Browser
4.	Search Engines
5.	Software Development kit
6.	Android Studio

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Creating an Android app project.
- Deploying the app to an emulator and a device.
- Building a layout with UI elements including a scrolling list.



### 0714-E&A-6. Build robust UI for greater UX (user experience)

**Overview:** This competency unit covers the skills and required knowledge to Create mobile application development environment, build different components of Mobile applications, integrate components with activities, customize themes and styles, create accessible and easily localizable apps, define UI Testing and the Espresso Framework, perform manual testing and automated Testing and how to Espresso and UI Automator.

Competency Unit	Performance Criteria
<b>CU1. Use controls</b>	<b>P1.</b> Build activity and use image buttons, clickable images, input controls like switches, spinners (Drop down menu). <b>P2.</b> Setup application bar and option menu in application. <b>P3.</b> Use alert dialog and date picker. <b>P4.</b> Add tabs to application.
<b>CU2. Make Robust UX</b>	<b>P1.</b> Add drawable, styles and themes to app <b>P2.</b> Apply material design guidelines to lists and cards. <b>P3.</b> Use material design colors. <b>P4.</b> Use resource layout folders to allow app to work well in different orientations and screen sizes. <b>P5.</b> Use Espresso, a mechanism for recording user interactions, to test app's user interface.

### Knowledge & Understanding

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

- Describe themes and styles.
- Learn to use drawables, which are compiled images. Learn how styles and themes can give app a consistent look with less XML code.
- Learn about material design, a visual design philosophy that allows apps to include material design attributes, such as depth and elevation.
- Creating accessible and easily localizable apps.
- Learn how to create layouts that work well for different screen sizes and orientations, different devices, different locales and languages, and different versions of Android.
- Define UI Testing and the Espresso Framework.
- How to perform manual testing and automated Testing.
- How to Espresso and UI Automator.

### Tools and Equipment

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



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S. No.	Items
1.	Recommended Computer System min 5 generation with 8 GB and SSD drive
2.	Internet Connection
3.	Web Browser
4.	Search Engines
5.	Software Development kit
6.	Android Studio

**Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Apply theme and style to the application
- Perform User Interface testing and prepare report



## 0714-E&A-7. Test, Debug and use support libraries

**Overview:** This competency unit covers the skills and required knowledge to create adaptive, responsive user interfaces that work across a wide range of devices, to create engaging, responsive interfaces that use material design principles and test app's user interface.

Competency Unit	Performance Criteria
<b>CU1. Test Application using Junit</b>	<b>P1.</b> Create local unit testing using Junit <b>P2.</b> Build test cases <b>P3.</b> Run test
<b>CU2. Make Application for backward compatible</b>	<b>P1.</b> Select Android Support libraries <b>P2.</b> Use support libraries to get backward compatible version of new Android features

### Knowledge & Understanding

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

- Describe Setting and muting breakpoints.
- Describe testing methods.
- How to use support libraries to ensure app is backward compatible with previous versions of Android.

### Tools and Equipment

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

S. No.	Items
1.	Recommended Computer System min 5 generation with 8 GB and SSD drive
2.	Internet Connection
3.	Web Browser
4.	Search Engines
5.	Software Development kit
6.	Android Studio

### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Debug code and identify errors
- Perform Unit testing





## 0714-E&A-8. Program/use background applications

**Overview** This competency unit covers the skills and required knowledge to connect to the Internet in a background thread to find the author of any book and also build apps that send notifications and schedule tasks, and you learn how to implement scheduling functionality for apps that run on earlier versions of Android.

Competency Unit	Performance Criteria
<b>CU1. Run background tasks</b>	<p><b>P1.</b> Add background threads to run a task in the background.</p> <p><b>P2.</b> Enable app to connect to the internet using a background task.</p> <p><b>P3.</b> Update task keeps running if the user changes their device's orientation.</p> <p><b>P4.</b> Responds to a system broadcast.</p> <p><b>P5.</b> Send and receive a custom broadcast.</p> <p><b>P6.</b> Use Job Scheduler to schedule tasks in a way that reduces battery drain.</p> <p><b>P7.</b> Schedule and cancel an alarm.</p> <p><b>P8.</b> Create code to integrate API</p>
<b>CU2. Authorize/ Use APIs in code</b>	<p><b>P1.</b> Authorize API</p> <p><b>P2.</b> Use REST API</p> <p><b>P3.</b> Use Google APIs</p>
<b>CU3. Manage notifications</b>	<p><b>P1.</b> Program to send a notification.</p> <p><b>P2.</b> Program to update a notification.</p>

### Knowledge & Understanding

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

- Describe threads.
- Learn how to enable your app to connect to the internet.
- Define the functionality of JSON.
- Learn about how to manage background threads (like using AsyncTask/ java.util.concurrent) to run work in the background so that the user does not have to wait for the task to complete.
- Describe how to send, receive and respond to a system broadcast.
- How to minimize battery drain.
- How to use support libraries to ensure app is backward compatible with previous versions of Android.
- Learn how to create, deliver, and reuse notifications



## **Tools and Equipment**

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

S. No.	Items
1.	Recommended Computer System min 5 generation with 8 GB and SSD drive
2.	Internet Connection
3.	Web Browser
4.	Search Engines
5.	Software Development kit
6.	Android Studio

## **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Create a program to run task in background.
- How to establish an internet connection.
- How to send an HTTP request.
- Describe work asynchronously in the background.
- How to use background tasks.
- Describe the functionality of Broadcast Receivers.
- Role of services in android application.



### 0714-E&A-9. Save user data/Integrate android application with database

**Overview:** This competency unit covers the skills and required knowledge to use sharedpreferences to save simple key value pairs, learn how to use the online databases (like firebase), SQLite database and Room, file I/O to save, retrieve, and update user data and introduction to the Android Architecture Components

Competency Unit	Performance Criteria
<b>CU1. Manipulate data using SharedPreferences</b>	<b>P1.</b> Use SharedPreferences to save and retrieve user preferences. <b>P2.</b> Add a settings activity to an app to save the user's preferred app settings.
<b>CU2. Manipulate data using File I/O</b>	<b>P1.</b> Build activity to store data in file <b>P2.</b> Add/update and delete data from file
<b>CU3. Manipulate data in SQLite/Room</b>	<b>P1.</b> Create database in SQLite database <b>P2.</b> Use Android's Room to save and retrieve data in the database. <b>P3.</b> Add / update and delete data
<b>CU4. Manipulate data using online databases</b>	<b>P1.</b> Create online database (Like firebase) <b>P2.</b> Import libraries to connect with database <b>P3.</b> Store, update, retrieve and update data

### Knowledge & Understanding

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

- Describe the functionality of SharedPreferences.
- Describe the functionality of DBMS
- Define database and its application.

### Tools and Equipment

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

S. No.	Items
1.	Recommended Computer System min 3 generation with 8 GB and SSD drive
2.	Internet Connection
3.	Web Browser
4.	Search Engines
5.	Software Development kit
6.	Android Studio



### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Make a code and store data in file I/O
- Demonstrate to store data in SQLite
- Demonstrate to use SharedPreferences to save and retrieve user preferences.



#### 0714-E&A-10. Set up Cloud Sever

**Overview:** This competency unit covers the skills and required knowledge to install and operate computer operating systems and hardware. The underpinning knowledge regarding computer operating systems and hardware will be sufficient to provide the basis for the job at workplace.

Competency Units	Performance Criterion
<b>CU1. Select a Cloud Service Provider</b>	<b>P1.</b> Perform social engineering on cloud service provider and generate comparison report <b>P2.</b> Evaluate Technical capabilities and processes
<b>CU2. Configure Virtual Machines</b>	<b>P1.</b> Set up cloud account <b>P2.</b> Login to the subjected cloud <b>P3.</b> Select the required Operating System for server <b>P4.</b> Create the Virtual machine <b>P5.</b> Configure accessibility using FTP/SSH <b>P6.</b> Conduct test for verification of allocated resources <b>P7.</b> Install applications on the subjected machines
<b>CU3. Configure Virtual Network</b>	<b>P1.</b> Select required specification for your network <b>P2.</b> Select resources to create virtual network <b>P3.</b> Launch resources to create virtual network <b>P4.</b> Connect the hosts with virtual network <b>P5.</b> Test the virtual network
<b>CU4. Perform Basic Security</b>	<b>P1.</b> Determine security requirements and specifications <b>P2.</b> Inspect network design to detect security flaws <b>P3.</b> Select security operation as per requirement <b>P4.</b> Add from for input controls like on off button
<b>CU5. Perform Cloud Computation</b>	<b>P1.</b> Determine the requirement and specification for computing of applications <b>P2.</b> Launch cloud tool for required application <b>P3.</b> Assign resources to host <b>P4.</b> Install the required application as per instruction <b>P5.</b> Test the environment
<b>CU6. Perform Cloud Networking</b>	<b>P1.</b> Determine the requirement and specification for your network <b>P2.</b> Launch resources to create virtual network <b>P3.</b> Connect the hosts with virtual network <b>P4.</b> Test the virtual network



<b>CU7. Create backup and restore virtual machine</b>	<b>P1.</b> Find suitable utilities <b>P2.</b> Install utility on sever <b>P3.</b> Create virtual machine image <b>P4.</b> Create job schedule for backups <b>P5.</b> Configure backup repository <b>P6.</b> Restore virtual machine backups
<b>CU8. Deploy Provisioning and Management</b>	<b>P1.</b> Determine the requirement and specification for deployment of resources <b>P2.</b> Launch the cloud tool for deploying of application <b>P3.</b> Create the resources for required tasks <b>P4.</b> Install the required application as per instruction <b>P5.</b> Select the management tool to manage resources as per instruction <b>P6.</b> Make the local backup on storage device <b>P7.</b> Finalize the process

### Understanding and Knowledge:

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

- Basic knowledge of current industry-accepted operating system, hardware and software products
- Basic Understanding of Browsing
- Basic concept of Virtual Machines
- Understanding of different cloud standards
- Strong familiarity with Linux and Windows operating systems and cloud provider ecosystems like Amazon AWS
- Practical knowledge of any cloud foundation services related to compute, network, storage, content delivery, administration and security, deployment and management, automation technologies
- DevOps know-how building and deploying infrastructure with cloud deployment, build and test automation technologies
- Understanding of complex enterprise environments and current technology areas like cloud and mobility Interoperability between operating systems
- Basic knowledge of current industry-accepted operating system, hardware and software products



**Tools & Equipment required:**

Sr. No	Description
1	Laptop/Desktop system
2	Internet connection
3	Access to cloud service provider like AWS/Azure/Any VPS
4	SSH, Putty, core FTPLE, VMware
5	CentOS
6	Virtual Box

**Critical Evidence(s) Required**

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

- Configure VM and run application on cloud server



## 0714-E&A-11. Develop Program in Python

**Overview:** This competency unit covers the skills and required knowledge to demonstrate the understanding of basic programming. It provides a detailed grasp on basic programming skills required for program development.

Competency Unit	Performance Criteria
<b>CU1. Develop Basic programing concepts in Python</b>	<b>P1:</b> Install Python <b>P2:</b> Set environment variable <b>P3:</b> Execute python script terminal <b>P4:</b> Declare variables according to the requirements <b>P5:</b> Use decision statement as per the requirement of problem <b>P6:</b> Initialize loop control variable <b>P7:</b> Declare and initialize different data structures <b>P8:</b> Define loop to access array <b>P9:</b> Access elements of array to perform actions as per requirement of the problem <b>P10:</b> Debug the code in case of error <b>P11:</b> Run the code to display the correct answer
<b>CU2. Develop programs using basic classes</b>	<b>P1:</b> Declare the functions to perform the assigned task <b>P2:</b> Call multiple functions with different parameters and display results. <b>P3:</b> Declare member functions and variables of the class <b>P4:</b> Create the objects <b>P5:</b> Access the functions and data of particular objects. <b>P6:</b> Debug the code in case of error <b>P7:</b> Run the code to display the correct answer

### Knowledge & Understanding

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

- Understanding the basic problem to be solved.
- Identification of programming concept required in it.
- Understanding of IDE being used for the selected language.
- Understanding of debugger
- Understanding of basic Data Types, Variables and Constants basic input and output statements.
- Understanding of Python
- Understanding of decision control statements.
- Understanding of Repetition (Loops) statements.
- Understanding of Arrays
- Understanding of Functions





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- Understanding of commonly used built-in libraries
- Define Pointer and address handling
- Understanding of object-oriented programming (OOP).
- Differentiation between objects and classes
- Basic Understanding of Encapsulation and data abstraction
- Basic Understanding of Inheritance

### **Tools and Equipment**

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

S. No.	Items
1	IDE for C++ / Python (Py charm / Dev C++)
2	Laptop/Desktop

### **Critical Evidence(s) Required**

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

1. Programs developed by the student



## 0714-E&A-12. Deploy hardware protection

**Overview:** This competency unit covers the skills and required knowledge to demonstrate the basic principles of network security. It provides an introduction to the main theories and activities associated with hardware security techniques being applied in network security industry

Competency Unit	Performance Criteria
<b>CU1. Set Up a Basic Firewall</b>	<p><b>P1:</b> Install firewall on operating system</p> <p><b>P2:</b> Update firewall</p> <p><b>P3:</b> Delete, disable, or rename any default user accounts, and change all default passwords</p> <p><b>P4:</b> Create additional accounts with limited privileges based on responsibilities</p> <p><b>P5:</b> Set up firewall zones and IP addresses</p> <p><b>P6:</b> Configure access control lists (i.e set inbound and outbound rules)</p> <p><b>P7:</b> Configure other firewall services and logging</p> <p><b>P8:</b> Perform testing on firewall configuration</p> <p><b>P9:</b> Update firmware and firewall, if required.</p> <p><b>P10:</b> Generate report from firewall logs</p> <p><b>P11:</b> Perform vulnerability scans</p>
<b>CU2. Protect IoT gateway from Wifi Attacks</b>	<p><b>P1:</b> Detect intruders in the communication network through vulnerability scans</p> <p><b>P2:</b> Select packet capture and injection in Wi-Fi attacks</p> <p><b>P3:</b> Prepare IoT against Wi-Fi intruder attack</p> <p><b>P4:</b> Apply AES/TKIP on IoT gateway</p> <p><b>P5:</b> Apply MAC address filtering</p> <p><b>P6:</b> Perform vulnerability test for IoT gateway</p>
<b>CU3. Secure device to device / end to end communication</b>	<p><b>P1:</b> Implement microservices by applying physical security</p> <p><b>P2:</b> Manage any default user accounts, and change all default passwords</p> <p><b>P3:</b> Create additional accounts with limited privileges based on responsibilities</p> <p><b>P4:</b> Update firmwares</p> <p><b>P5:</b> Isolate IoT devices by securing device to device communication through wireless PAN protocols</p> <p><b>P6:</b> Secure cloud and IoT device connection by applying SSL</p>



**P7:** Secure communication from device to gateway by encryption protocols

### **Knowledge & Understanding**

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

- Understanding of information security
- Understanding of intruder knowledge
- Understanding of security threats
- Understanding of security attacks
- Differentiate between threats and attacks
- Exemplify passive and active attacks
- Understanding authentication
- Understanding data confidentiality
- Understanding of data integrity
- Recognize security threats
- Recognize security attacks
- Demonstrate difference between physical attack, networks attack, software attack, and encryption attack with example
- Understanding of SSL certificate
- Understanding of Physical security and techniques (Deterrence, delay and detect)
- Basic knowledge of Information system assets
- Basic knowledge of elements of Web servers, Database server, topologies, sockets and networking.
- Understanding and knowledge of connection types between web servers and data base servers.
- Basic understanding of networking components such as servers, routers, clients.
- Knowledge of Operating system used to protect information system assets.
- Understanding of Firewall and it Protocols

### **Tools and Equipment**

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

S. No.	Items
1	Windows operated Computer (PC/ Laptop)
2	Arduino IDE
3	NodeMCU / Raspberry PI
4	

### **Critical Evidence(s) Required**

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



***National Competency Standards for “Internet of Things (IoT)”***



What are different Physical Threats give 3 examples



### 0714-E&A-13. Perform software security

**Overview:** This competency unit covers the skills and required knowledge to demonstrate the understanding of basic principles of software security for IoTs. It provides an introduction to the main theories and activities associated with implementation of encryption and decryption of MQTT protocol for wireless security for the job at workplace

Competency Unit	Performance Criteria
<b>CU1. Apply Secure Service Layer (SSL) in client server applications</b>	<b>P1:</b> Install OpenSSL library on server and client side. <b>P2:</b> Create TCP socket and apply SSL on server application <b>P3:</b> Create TCP socket and apply SSL on client application <b>P4:</b> Generate SSL certificates for client. <b>P5:</b> Install these certificates on server <b>P6:</b> Establish SSL based client server communication
<b>CU2. Secure MQTT with Encryption and Decryption</b>	<b>P1:</b> Install NodeMCU Crypto module in Arduino IDE <b>P2:</b> Program NodeMCU to connect to a MQTT broker <b>P3:</b> Generate a pseudorandom initialization vector <b>P4:</b> Program a hash function for authentication with nodeid, iv, data, and session ID <b>P5:</b> Compute a HMAC SHA1 <b>P6:</b> Store payload in a structure <b>P7:</b> Send payload structure via function <b>P8:</b> Load payload information <b>P9:</b> Compare the received and computed HMAC

### Knowledge & Understanding

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

- Understand software security and communication protocol
- Basic understanding of MQTT protocols
- Program to connect to an MQTT broker
- Programming of NodeMCU
- Programming in Arduino IDE
- Exemplify encryption and decryption
- Enlist security ambiguities in MQTT protocol
- Enlist attacks and threat in MQTT protocol
- Categorize software security components
- Enlist Software security and communication protocol
- Identify security protocol for MQTT protocol



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- Understanding and knowledge of transport layer security
- Basic implementation knowledge of openSSL

### **Tools and Equipment**

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

S. No.	Items
1	Computer (PC/ Laptop)
2	Arduino IDE
3	NodeMCU
4	Python/C

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Program snippets to MQTT and openSSL
- Present configuration files to secure MQTT



#### 0714-E&A-14. Implement Cryptography and Network Security

**Overview:** This competency unit covers the skills and required knowledge to demonstrate the understanding of basic principles of network security and cryptography. It provides an introduction to the main theories and activities associated with cryptography techniques being applied in network security industry for job at workplace

Competency Unit	Performance Criteria
<b>CU1. Set up anaconda environment for security</b>	<b>P1:</b> Download the Anaconda for python platform <b>P2:</b> Install Anaconda <b>P3:</b> Set environment variable <b>P4:</b> Execute python script on Anaconda terminal
<b>CU2. Implement Cryptography library in Anaconda environment</b>	<b>P1:</b> Import cryptography library in new notebook <b>P2:</b> Apply cryptography library in program <b>P3:</b> Execute the Code <b>P4:</b> Verify the encrypted answer <b>P5:</b> Add the decryption code in program and execute again <b>P6:</b> Verify the answer for entered string
<b>CU3. Implement Hash Function in Anaconda environment</b>	<b>P1:</b> Import Hash Function library in new notebook <b>P2:</b> Apply hash functions in the program <b>P3:</b> Execute the code <b>P4:</b> Verify that entered string is Hash or not

#### Knowledge & Understanding

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

- Knowledge of basic elements of Cryptography, Hash Function and network security.
- Knowledge of Implementation of cryptography and Hashing in python
- Knowledge of Implementation of the built-in libraries in program
- Knowledge of different IDEs and environments for python
- Process setup anaconda environment for python

#### Tools and Equipment

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

S. No.	Items
1	Windows operated Computer (PC/ Laptop)
2	Anaconda

#### Critical Evidence(s) Required



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The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Implementation of the built-in libraries in program
- Implementation of cryptography and Hashing in python





### 0714-E&A-15. Manage and Supervise the Job Activities

**Overview:** This competency standard covers the skills and knowledge required to manage and supervise the job activities. You will be able to plan and supervise on-site operations / activities and doing the on -site inspection and prepare a report. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
<b>CU1. Plan for on-site operations</b>	<p><b>P1:</b> Consult with the client to obtain required information</p> <p><b>P2:</b> Prepare SOPs in accordance with the identified requirements.</p> <p><b>P3:</b> Prepare the process flow diagram in order to achieve Quality outcome.</p> <p><b>P4:</b> Break down work of activities into small achievable components and efficient sequences</p> <p><b>P5:</b> Recognize site hazards and the personal protective equipment (PPE) and safety procedures specified for job</p> <p><b>P6:</b> Organize site induction for support personnel as required</p> <p><b>P7:</b> Plan housekeeping activities prior to and post completion of work</p>
<b>CU2. Supervise work activities to achieve desired results</b>	<p><b>P1:</b> List and arrange required resources prior to commencement of work</p> <p><b>P2:</b> Recognize the areas of work which could result in a delay of work, wastage of material or damage to tools.</p> <p><b>P3:</b> Allocate responsibility to required team members to avoid conflicts</p> <p><b>P4:</b> Review work plan in response to new information, urgent requests, changed situations or instructions from concern personnel</p> <p><b>P5:</b> Cooperate with team members to achieve common goals</p>
<b>CU3. Perform on- site inspection</b>	<p><b>P1:</b> Conduct inspection of processes &amp; materials according to inspection plan</p> <p><b>P2:</b> Identify defects and deficiencies in product &amp; processes</p> <p><b>P3:</b> Record defects and deficiencies with evidence in product &amp; processes (if required)</p> <p><b>P4:</b> Perform test as per standard procedure for determining the physical properties of materials and product.</p> <p><b>P5:</b> Check the actions taken for rectification of snag list</p>



	<b>P6:</b> Record the non-compliance and expected breaches of contract as per SOPs.
<b>CU4. Prepare the inspection report</b>	<b>P1:</b> Collect and review the information relevant to inspection activities for recoding inspection results <b>P2:</b> Verify the integrity of information supplied by other party as a part of the inspection process <b>P3:</b> Record inspection observations and findings <b>P4:</b> Recommend the necessary corrective actions for tackling the identified problems

### **Knowledge & Understanding**

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

- Principles of planning and project management
- Roles and responsibilities for different levels of site supervision.
- Information relevant to inspection activities and work document preparation for recoding inspection results.
- Documentation and record system of the inspection body
- Different types of deficiencies in inspection activities
- Site problems and recommended corrective actions
- Awareness of environmental sustainability issues as they relate to the work task.

### **Critical Evidence(s) Required**

The candidate needs to produce any or all of the following documents/evidences:

- Design effectively the supervision and inspection program in accordance with specifications
- Handle inspection items and samples by appropriate methods to meet the traceability requirements.
- Collaborate with the team members for allied works at crushing plant site.



### 0714-E&A-16. 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.

Competency Unit	Performance Criteria
<b>CU1. Develop a business plan</b>	<b>P1.</b> Conduct a market survey to collect information. <b>P2.</b> Select the best option in terms of cost, service, quality, sales, profit margins, overall expenses <b>P3.</b> Compile the information collected through the market survey, in the business plan format
<b>CU2. Collect information regarding funding resources</b>	<b>P1:</b> Identify the available funding sources based on their terms and conditions, maximum loan limit, payback time, interest rate <b>P2:</b> Choose the best available option according to investment requirement <b>P3:</b> Prepare documents according to the loan agreement requirement <b>P4:</b> Include the information of funding sources in the business plan
<b>CU3. Develop a marketing plan</b>	<b>P1:</b> Collect information required to devise marketing plan <b>P2:</b> Prepare marketing plan for new business
<b>CU4. Develop basic business communication skills</b>	<b>P1:</b> Communicate with internal customers and external customers <b>P2:</b> Use different modes of communication to communicate internally and externally e.g.: presentation, speaking, writing, listening, visual representation, reading etc. <b>P3:</b> Use specific business terms used in the market

### Knowledge & Understanding

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

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



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- 7Cs of business communication
- Different modes of communication and their application in the industry
- Specific business terms used in the industry
- Available funding sources
- Low interest loans to start a new business
- Market survey and its tools e.g.: questionnaire, interview, observation etc.,.
- Market trends for specific product offering
- State the main elements of business plan
- Business plan format

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- List 7Ps of marketing
- List 7Cs of business communication



### 0714-E&A-17. Create/Manage Profile on Freelancing Platform

**Overview:** This competency standard covers the skills and knowledge required to create/manage profile on a non-traditional freelance platform.

Competency Unit	Performance Criteria
<b>CU1. Recognize Gig Economy</b>	<p><b>P1.</b> Enlist at least 03 strong reasons to work as a freelancer</p> <p><b>P2.</b> Identify the terminologies related to the freelancing platform like (Gig, profiles, rating, review, revision and a bid etc.)</p> <p><b>P3.</b> Identify the most in demand freelance skills on non-traditional platform</p>
<b>CU2. Setup Profile</b>	<p><b>P1.</b> Set Up a Seller Profile</p> <p><b>P2.</b> Add personal and professional information on your profile</p> <p><b>P3.</b> Link up social media and other professional accounts to seller profile</p>
<b>CU3. Create the Gigs</b>	<p><b>P1.</b> Find your ideal category and services</p> <p><b>P2.</b> Check out the competition</p> <p><b>P3.</b> Create an appealing title for the gig</p> <p><b>P4.</b> Choose subcategory and tags</p> <p><b>P5.</b> Create and price gig packages</p> <p><b>P6.</b> Win buyers with gig description</p> <p><b>P7.</b> Boost gig success with visuals</p> <p><b>P8.</b> Choose a suitable gig package among Basic, Standard and Premium options.</p>
<b>CU4. Provide High Quality Services as a seller.</b>	<p><b>P1.</b> Present a professional profile</p> <p><b>P2.</b> Get and maintain high rating</p> <p><b>P3.</b> Be responsive and polite to customer</p>
<b>CU5. Develop/Increase Business</b>	<p><b>P1.</b> Deliver the work on agreed deadline</p> <p><b>P2.</b> Ask for feedback form the client</p> <p><b>P3.</b> Keep in touch with Buyers/Customers</p> <p><b>P4.</b> Use the contacts page to maintain close coordination with the potential buyers/customers</p> <p><b>P5.</b> Request customer to recommend you to other clients and work circles</p>



**P6.** Abide by the rules and regulations of freelance platform in order completion and cancelation

### **Knowledge & Understanding**

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

- Describe what is gig economy.
- Differentiate between a seller and a buyer in non-traditional freelancing.
- Write down the characteristics of a powerful gig.
- List down the qualities of a top-level seller.
- Prepare a business development strategy for a seller.

### **Tools and Equipment**

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

S. No.	Items
1.	Computer System
2.	Internet Connection
3.	Browser
4.	Email Account
5.	Bank account
6.	Microsoft Office (Word, Excel, PowerPoint)
7.	Seller Profile on Non-traditional Freelance Platform (Fiverr)

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Setup a seller account/profile.
- Create a gig for SEO based Content Writing.



## 0714-E&A-18. Write Proposals for Freelance Projects

**Overview:** This competency standard covers the skills and knowledge required to write professional proposals for freelance projects.

Competency Unit	Performance Criteria
<b>CU1. Write a winning proposal</b>	<p><b>P1.</b> Start proposal with the lines which show your interest and care in the project</p> <p><b>P2.</b> Write ideas and suggestions in original sentences (Don't Copy &amp; Paste)</p> <p><b>P3.</b> Present yourself as a problem solver in proposal, suggest one or two workable ideas for the project.</p> <p><b>P4.</b> Mention expertise to tell the buyer why you are the best person for the specific project</p> <p><b>P5.</b> Ask for the resources (Website link etc.) to get more familiar about the business/buyer</p> <p><b>P6.</b> Ask for the reply from the client in response to suggestions</p>
<b>CU2. Adopt best practices of proposal writing</b>	<p><b>P1.</b> Analyze the project details beforehand</p> <p><b>P2.</b> Avoid scripted bid proposals</p> <p><b>P3.</b> Don't sound impersonal</p> <p><b>P4.</b> Avoid being too hasty in committing your time</p> <p><b>P5.</b> Do not underbid fellow freelancers</p> <p><b>P6.</b> Check buyer's history</p> <p><b>P7.</b> Use phrases that sell in the market</p> <p><b>P8.</b> Check competitor's reputation</p> <p><b>P9.</b> Proofread the bid</p>

### Knowledge & Understanding

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

- Write the features of a good bid proposal.
- Write a sample bid proposal for an essay writing job, highlight your skills/strengths for the job.



## **Tools and Equipment**

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

S. No.	Items
1.	Computer System
2.	Internet Connection
3.	Browser
4.	Email Account
5.	Bank account
6.	Microsoft Office (Word, Excel, PowerPoint)
7.	Seller Profile on a Freelance Platform (Upwork, Guru, freelancer.com etc.)

## **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Prepare a bid proposal for a research based article writing project.





### 0714-E&A-19. Practice Professionalism

**Overview:** This competency standard deal with learning the competencies needed to develop portfolio for industry. You can perform internship. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
<b>CU1. Develop Portfolio for industry</b>	<b>P1:</b> Select previous assignments for portfolio <b>P2:</b> Work on previous selected assignments for portfolio <b>P3:</b> Compile variety of assignments for portfolio <b>P4:</b> Make Professional Portfolio for industry <b>P5:</b> Develop Digital Portfolio for industry
<b>CU1. Perform Internship</b>	<b>P1:</b> Prepare for internship <ul style="list-style-type: none"><li>• Personal Presentation</li><li>• Portfolio Presentation</li></ul> <b>P2:</b> Interview preparation <b>P3:</b> Demonstrate Ethics for Internship <b>P4:</b> Identify Industry for internship <b>P5:</b> Perform Internship in Industry <ul style="list-style-type: none"><li>• Fill the Performa of Internship</li></ul> <b>P6:</b> Report the performance of internship

### Knowledge & Understanding

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

- Importance of portfolio
- Ethics for Internship

### Critical Evidence(s) Required

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

- Professional
- Portfolio