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ANDROID APPLICATION DEVELOPER

CBT Curriculum

National Vocational Certificate Level 4

Version 1 - November 2019

NAVTTC

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ANDROID APPLICATION DEVELOPER

CBT Curriculum

National Vocational Certificate Level 2

Version 1 - November 2019

Introduction

Definition/ Description of the training programme for *Android Application Developer*

This course is designed for students who are new to programming, and have a passion to learn how to develop Android apps. The learners will acquire knowledge to create an Android project with Android Studio.

This course will provide the overview and advanced training for Android app development. Android app development is the process by which new smartphone applications are created for devices running the Android operating system. Android apps can be developed using Android Studio (Java / Kotlin) . Each competency standard contains one or more skill-set with hands-on development exercises. Learners taking the course assimilate most of the Android programming concepts and build a variety of apps.

The course will provide learners with an understanding of key points in the Android app development from the initial process to the end product .It is specifically designed to teach the critical skills needed to be successful in this specific field and thoroughly understand the app life cycle and its main components, setting up and understanding of Android Development Environment., identify different techniques to plan, design and prototype of mobile apps before writing any code, Create a graphical user interface (GUI), Designing and building a functional Android application, Debugging Android applications using different tools and plugins, register and publishing on Play Store.

Purpose of the training programme

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

The purpose of these qualifications is to set professional standards for Android Application Developerwho will serve as key elements enhancing quality of Pakistan’s Software Developing Industry.

Overall objectives of training programme

The specific objectives of developing these qualifications are as under:

- Develop knowledge, skills and understanding through the making of Android Application that leads to and demonstrates conceptual and technical accomplishment;
- Provide you with an introduction to Computer IT Skills & Mobile App Developer.
- Support you to acquire specialist knowledge and practical experience of developing Android Application.
- Encourage you to test and explore different software for Knowledge, understanding and implementation.
- Enable you to develop an individually negotiated practice informed by a relevant theoretical and contextual framework.
- Produce informed independent and technically sound developers who can adapt their knowledge, understanding and skills for a variety of professional Applications.

Competencies to be gained after completion of course

At the end of the course, the trainee must have attained the following competencies:

- Perform and comply Personal & workplace Health and Safety Guidelines and take initiatives where required
- Perform effective Communication at workplace
- Identify, Implement & Follow Workplace Policy and Procedure
- Perform IT & Computer Application Skills
- Manage Human Resource Services
- Develop Entrepreneurial Skills & Manage Personal Finances
- Use information technology skills capable of Android Development
- Use Basics of Programming
- Interpret Technical Requirements for Apps Development
- Use Data Bases for Apps Development
- Design User Interface for Mobile Apps
- Develop Android Apps
- Test & Integrate Mobile App Components

- Deploy Mobile Apps
- Use Social Media for Marketing
- Integrate New features for Android Apps
- Undertake Research & Planning for Apps Development
- Develop and Analyse Algorithm for Coding
- Develop Software Development Life Cycle (SDLC) for Apps Development
- Apply Design Pattern for Android App
- Develop Professional Android App
- Assure the Quality of Mobile App
- Develop Professionalism Capable of Android Development

Possible available job opportunities available immediately and later in the future

Android Application Developers can be hired as:

- Freelance developer
- Android app developer
- Consultant
- Assessor
- Teacher
- Entrepreneur
- Assistant app developer
- Self-employment
- Quality assurance assistant
- Social media marketing expert
- Mobile App Search Optimization (ASO)

Trainee entry level

- Minimum middle withLevel3 for level 4

Minimum qualification of trainer

- BS/BE (CS/IT/SE) Equivalent to 16 years of education
- BCS equivalent to 14 years of education with recent relevant industry experience of 2 years

Recommended trainer: trainee ratio

The recommended maximum trainer: trainee ratio for this programme is 1 trainer for 20 trainees.

Medium of instruction i.e. language of instruction

Instruction will be in urdu and English.

Duration of the course (Total time, Theory & Practical time)

This curriculum comprises 13 modules. The recommended delivery time is 1300 hours. Delivery of the course could therefore be full time, 5 days a week, for 12 months. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The full structure of the course is as follow:

Module	Theory[1] Days/hours	Workplace[2] Days/hours	Total hours
Module 20: Contribute to Work Related Health and Safety (WHS) Initiatives			30
Module 21: Analyze Workplace Policy and Procedures			30
Module 22: Perform Advanced Communication			30
Module 23: Develop Advance Computer Application Skills			40
Module 24: Manage Human Resource Services			20
Module 25: Develop Entrepreneurial Skills			30
Module 26: Undertake Research & Planning for Apps Development	12	78	90
Module 27: Develop and Analyse Algorithm for Coding	30	100	130
Module 28: Develop Software Development Life Cycle (SDLC) for Apps Development	60	410	470
Module 29: Apply Design Pattern for Android App	40	210	250

1 Learning Module hours in training provider premises
2 Training workshop, laboratory and on-the-job workplace

Module	Theory[1] Days/hours	Workplace[2] Days/hours	Total hours
Module 30: Develop Professional Android App	52	118	170
Module 31: Assure the Quality of Mobile App	60	130	190
Module 32: Develop Professionalism Capable of Android Development	20	80	100

Sequence of the modules

This qualification is made up of 13 modules which covers Level 4. Seven modules relate to the Level 4 advance supervisory skills of an Android App Developer. These Modules are 26, 27, 28,,29, 30 31, 32 .The distribution table suggests that these should be delivered with advance level of Android Application Development. There are 6 further modules relating to general skills that an Android App Developer, must have, for example; Contribute to Work Related Health and Safety (WHS) Initiatives, Analyze Workplace Policy and Procedures, Perform Advanced Communication, Develop Advance Computer Application Skills, Manage Human Resource Services, Develop Entrepreneurial Skills .They need to be delivered in parallel with technical and functional modules of Level 4.

Each module covers a range of learning components. These are intended to provide detailed guidance to teachers (for example the Learning Elements component) and give them additional support for preparing their lessons (for example the Materials Required component). The detail provided by each module will contribute to a standardized approach to teaching, ensuring that training providers in different parts of the country have clear information on what should be taught. Each module also incorporates the cultural background of Pakistan, including specialist features and technology that make this qualification unique to Pakistan’s needs.

The distribution table is shown below:

Module 26: Undertake Research & Planning for Apps Development	Module 27: Develop and Analyse Algorithm for Coding	Module 28: Develop Software Development Life Cycle (SDLC) for Apps Development
Module 29: Apply Design Pattern for Android App	Module 30: Develop Professional Android App	Module 31: Assure the Quality of Mobile App
Module 32: Develop Professionalism Capable of Android Development		

Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 20: Contribute to Work Related Health and Safety (WHS) Initiatives **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Contribute to Work Related Health and Safety (WHS) Initiatives	**LU1:** Contribute to initiate work-related health and safety measures **LU2:** Contribute to establish work-related health and safety measures **LU3:** Contribute to ensure legal requirements of WHS measures **LU4:** Contribute to review WHS measures **LU5:** Evaluate the organization's WHS system			30
Module 21: Analyze Workplace Policy and Procedures **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Analyze Workplace Policy and Procedures	**LU1:** Manage work timeframes **LU2:** Manage to convene meeting **LU3:** Decision making at workplace **LU4:** Set and meet own work priorities at instant **LU5:** Develop and maintain professional competence **LU6:** Follow and implement work safety requirements			30
Module 22: Perform Advanced Communication **Aim:** The aim of this module to develop basic knowledge, skills and understanding for Performing Advanced Communication	**LU1:** Demonstrate professional skills **LU2:** Plan and Organize work **LU3:** Provide trainings at workplace			30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 23: Develop Advance Computer Application Skills **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Develop Advance Computer Application Skills	**LU1:** Manage Information System to complete a task **LU2:** Prepare Presentation using computers **LU3:** Use Microsoft Access to manage database **LU4:** Develop graphics for Design			40
Module 24: Manage Human Resource Services **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Manage Human Resource Services	**LU1:** Determine strategies for delivery of human resource services **LU2:** Manage the delivery of human resource services **LU3:** Evaluate human resource service delivery **LU4:** Manage integration of business ethics in human resource practices			20
Module 25: Develop Entrepreneurial Skills **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Develop Entrepreneurial Skills	**LU1:** Develop a business plan **LU2:** Collect information regarding funding sources **LU3:** Develop a marketing plan **LU4:** Develop basic business communication skills			30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 26: Undertake Research & Planning for Apps Development **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Undertake Research & Planning for Apps Development	**LU1:** Identify Market Trends Using Apps **LU2:** Identify Required Skill set to Develop App **LU3:** Plan to Develop Apps (Work Flow)	102	18	20
Module 27: Develop and Analyse Algorithm for Coding **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Develop and Analyse Algorithm for Coding	**LU1:** Analyze Problem Statement for Possible Solutions **LU2:** Perform best Solutions	10	30	40

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 28: Develop Software Development Life Cycle (SDLC) for Apps Development **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Develop Software Development Life Cycle (SDLC) for Apps Development	**LU1:** Plan a Project **LU2:** Perform Requirement Analysis **LU3:** Design a Project **LU4:** Implement a Project **LU5:** Test a Project **LU6:** Execute a Project	20	100	120
Module 29: Apply Design Pattern for Android App **Aim:** The aim of this module to develop basic knowledge, skills and understanding for Applying Design Pattern for Android App	**LU1:** Identify the Basic of Design Pattern for Android App **LU2:** Implement Design Pattern for android app **LU3:** Test Design pattern for android App	15	55	70
Module 30: Develop Professional Android App **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Develop Professional Android App	**LU1:** Apply Version Control System **LU2:** Develop Android App using Web API's **LU3:** Develop Advance Interface Design	10	40	50

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 31: Assure the Quality of Mobile App **Aim:** The aim of this module to develop basic knowledge, skills and understanding to Assure the Quality of Mobile App	**LU1:** Prepare test cases **LU2:** Execute Test Cases **LU3:** Comply with Privacy Policy of App	10	40	50
Module 32: Develop Professionalism Capable of Android Development **Aim:** The aim of this module to develop basic knowledge, skills and understanding for Developing Professionalism Capable of Android Development	**LU1:** Develop Employability Skills **LU2:** Develop Freelance Business **LU3:** Expand Professional Network	10	40	50

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Module-20
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Modules

Module 20: Contribute to Work Related Health and Safety (WHS) Initiatives

Objective of the module:

Duration: **Theory:** **Practical:**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Contribute to initiate work-related health and safety measures**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU2: **Contribute to establish work-related health and safety measures**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU3: **Contribute to ensure legal requirements of WHS measures**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

LU4: **Contribute to review WHS measures**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU5: **Evaluate the organization's WHS system**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

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Module 21: Analyze Workplace Policy and Procedures

Objective of the module:

Duration: **Theory:** **Practical:**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Manage work timeframes**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU2: **Manage to convene meeting**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU3: **Decision making at workplace**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

LU4: **Set and meet own work priorities at instent**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU5: **Develop and maintain professional competence**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU6: **Follow and implement work safety requirements**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

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Module-22
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Module 22: Perform Advanced Communication

Objective of the module:

Duration: **Theory:** **Practical:**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Demonstrate professional skills**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU2: **Plan and Organize work**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU3: **Provide trainings at workplace**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

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Module 23: Develop Advance Computer Application Skills

Objective of the module:

Duration: **Theory:** **Practical:**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Manage Information System to complete a task**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU2: **Prepare Presentation using computers**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU3: **Use Microsoft Access to manage database**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

LU4: **Develop graphics for Design**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

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Module 24: Manage Human Resource Services

Objective of the module:

Duration: **Theory:** **Practical:**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Determine strategies for delivery of human resource services**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU2: **Manage the delivery of human resource services**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU3: **Evaluate human resource service delivery**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

LU4: **Manage integration of business ethics in human resource practices**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

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Module 25: Develop Entrepreneurial Skills

Objective of the module:

Duration: **Theory:** **Practical:**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Develop a business plan**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU2: **Collect information regarding funding sources**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		
LU3: **Develop a marketing plan**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

LU4: **Develop basic business communication skills**	**The trainee will be able to:**		**Total** **Theory:** **Practical:**		

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Module-26
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Module 26: 0613001026 Undertake Research & Planning for Apps Development

Objective of the module:

In this competency standard, the learner will be able to identify market trends using different sources and tools (App Annie) and establish required skill set. After completion of this competency standard learner will be able to construct work flow plan for developing Apps.

Duration:20 hours **Theory: 2 hours** **Practical: 18 hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Identify Market Trends Using Apps**	**The trainee will be able to:** Use Apps to identify market trends Explore market trends using social media Browse blogs to find market trends Design survey form to get market trends Identify target audience	Identifying the market trends using apps Understanding market competitors to identify market trends using social media Describing survey form for market trends. Collecting and enlisting data of the top trending applications. Enlisting various online blogs to find market trends Listing down the trending blogs for ASO Designing survey forms to track market trends such as google forms, survey monkey etc. Mapping out the target audience Targeting the identified audience via social media, blogs etc.	6 Hours **Theory:** 1 Hours **Practical:** 5 Hours		Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

LU2: **Identify Required Skill set to Develop App**	**The trainee will be able to:** Identify suitable programming language Identify suitable tools to develop app Identify the hardware requirements for developing app	Identifying the required skills set for developing app Enlisting suitable tools for app development Describing the existing hardware requirements Enlisting the hardware required for the app development	**Total** 7 Hours **Theory:** 0 Hours **Practical:** 7 Hours	Paper, pencil, erasers, Markers, Flip chart/white board, pen Rulers, Laptops/ desktops as per requirements, Microsoft Word, Printer, Multimedia	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom
LU3: **Plan to Develop Apps (Work Flow)**	**The trainee will be able to:** Develop timeline for app development. Develop app work flow based on gathered information. Develop a project proposal	Introduction to the basics of work flow. Planning to Develop project timeline using tools such as JIRA Describing the vision and scope of the app to be developed Differentiating between functional and nonfunctional specifications. Listing significant features of Apps to be developed. Highlighting the required features in documented form Explaining cost & time constraints of the app to be developed Developing cost & time proposal Writing down the final proposal Evaluating the drafted proposal	**Total** 7 Hours **Theory:** 1 Hours **Practical:** 6 Hours	Paper, pencil, erasers, Markers, Flip chart/white board, pen Rulers, Laptops/ desktops as per requirements, Microsoft Word, Printer, Multimedia	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

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Module 27: 0613001027 Develop and Analyse Algorithms for Coding

Objective of the module:

In this competency standard, the learner will be capable of identifying and presenting suitable solution of a specific problem, developing an associated work flow chart and implementation of an algorithm (Pseudo Code).

Duration:40 hours **Theory:10 hours** **Practical:30 hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Analyze Problem Statement for Possible Solutions**	**The trainee will be able to:** Gather information of issues for problem statement as per functional and non-functional requirements • Make a list of issues • Analyze the issues for problem statement • Review of problem statement constraints Identify different possible solutions for problem	Understanding client requirements. Explaining 5 W's(Who, What, Where, When, Why Listing down the gathered requirements Differentiating functional(FR) and non-functional requirements.(NFR) Explaining problem constraints. Explaining time complexity. Analyzing the typical FR & NFR such as business rules, reporting requirements, historical data, administrative functions, scalability, reliability, security maintainability etc. Explaining the classification of requirements for review of problem statement constraints such as business requirements, user requirements and system requirement etc.	**Total** 19 Hours **Theory:** 5 Hours **Practical:** 14 Hours	Paper, pencil, erasers, Markers, Flip chart/white board, pen Rulers, Laptops/ desktops as per requirements, Microsoft Word, Printer, Multimedia	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

		Identifying the solution consideration. E.g. solution requirements, stakeholder requirements, transition requirement etc. Recognizing Selected Algorithm. Identifying Parsing Algorithm into annotations and words.			
LU2: **Perform best Solutions**	**The trainee will be able to:** Make graphical representation of selected solution. Select best solution for problem as per given instruction Arrange the sequence of tasks Identify the statement of a pseudo code which establishes the main goal Write the pseudo code accordingly	Understanding flow chart components and use case diagrams Explaining the solution consideration. E.g. solution requirements, stakeholder requirements, transition requirement etc. Briefing Selected Algorithm. Explaining Parsing Algorithm into annotations and words. Explaining the priorities of the task Setting the priorities of the task Explaining the pseudo code Developing the pseudo code for the considered solution Analyzing the designed algorithm.	**Total** 21 Hours **Theory:** 5 Hours **Practical:** 16 Hours	Paper, pencil, erasers, Markers, Flip chart/white board, pen Rulers, Laptops/ desktops as per requirements, Microsoft Word, Printer, Multimedia	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

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Module-28
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Module 28: 0613001028 Develop Software Development Life Cycle (SDLC) for Apps Development

Objective of the module:

This competency standard will enable learner to understand and follow all steps required in planning of a project. After completion of this competency standard learner will be able to execute the project successfully.

Duration: 120 Hours **Theory: 20 Hours** **Practical: 100 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Plan a Project**	**The trainee will be able to:** Use task management tools to develop a timeline for a given project Distribute tasks across software team as per the	Understand project planning Understanding task management Importance of task management Understanding task management life cycle (planning, testing, tracking and reporting) Understanding project Timeline, and concepts such as Project scope statement, Work breakdown structure etc Understanding concepts of Task management tools using JIRA (Custom workflows, Time and progress tracking, Permissions etc Develop timeline for given project Understanding tasks, templates (Kanban, scrum), bugs, user stories to the backlog, prioritize the backlog, select work from the	**Total** 13 Hours **Theory:** 3 Hours **Practical:** 10 Hours	JIRA Computer Systems as per requirements Multimedia projector Printer Internet USB Paper, Pencil, Erasers White Boards Markers Dusters	Classrooms, IT lab or visit to Software Industry

	project specifications Track tasks of the team as per assigned module Generate report to evaluate performance of the team as per assigned task.	backlog, team meetings, control chart etc, Implementation of distribution of tasks using JIRA Learning Track time using Clockify Implementation of tracking of tasks as per given requirements Understanding velocity reports, burndown and burnup reports, dashboard gadgets, individual metrics Implementation of reports to evaluate team performance as per assigned task			
LU2: **Perform Requirement Analysis**	**The trainee will be able to:** Gather requirements by communicating with the customer for given project Analyze requirements to determine the quality of the given project Develop Software Requirement	Understanding requirement gathering steps such as Elicitation, Validation, Specification and Verification Implementation of Requirements gathering form customer for given project Understand requirement analysis, quality of requirements, unclear, incomplete, ambiguous and contradictory requirements Verify quality of requirements for given project Use SRS template, Understanding Purpose, overview, Details for specific requirements, document the deliverables, Approval for	**Total** 13 Hours **Theory:** 4 Hours **Practical:** 9 Hours	Computer Systems as per requirements Multimedia projector Printer Internet USB Paper, Pencil, Erasers White Boards Markers Dusters	Classrooms, IT lab or visit to Software Industry

	Specification (SRS) document for the given project	SRS, Prepare SRS for given project			
LU3: **Design a Project**	**The trainee will be able to:** Design components as per project specification Draw data flow diagrams according to Software requirement specification Create Entity Relationship diagram (ERD) according to data flow diagram Create UML diagram according to Software Requirement Specification (SRS)	Explaining Adobe XD Designing UI components as per Software Requirement Specification document using Adobe XD or any other products similar to it Implementation of Data flow diagrams using Microsoft Visio as per Software Requirement Specification document Identify and create entities, relationships, attributes using Microsoft Visio as per data flow diagram, Verify Entity Relationship diagram as per data flow diagram Identify and create main actors, roles, actions, artifacts and classes using Microsoft Visio as per Software requirement specification document Verify UML as per SRS document	**Total** 15 Hours **Theory:** 3 Hours **Practical:** 12 Hours	Computer Systems as per requirements Adobe XD Microsoft Visio Multimedia projector Printer Internet USB Paper, Pencil, Erasers White Boards Markers Dusters	Classrooms, IT lab or visit to Software Industry
LU4: **Implement a Project**	**The trainee will be able to:** Design Interface as per	Designing UI components as per document design in Adobe XD using Android Studio	**Total** 54 Hours **Theory:**	Computer Systems as per requirements	Classrooms, IT lab or visit to Software Industry

	application requirements Create database as per Entity Relationship diagram ERD Develop an application as per design UML and ERD	any other products similar to it Implementing database (Tables, Attributes Relationships etc) using SqLite/ REALMDB/ Firebase as per ERD Implementing Android Application project using Android Studio (Backend Development)	4 Hours **Practical:** 50 Hours	Android Studio Multimedia projector Printer Internet USB Paper, Pencil, Erasers White Boards Markers Dusters	
LU5: **Test a Project**	**The trainee will be able to:** Perform validation technique as per project requirements Test project as per Software Requirement Specification (SRS) document	Understanding Validation testing model such as (V-model) Validation of project using testing mechanisms such as unit testing, Integration testing, System testing and user Acceptance (As per SRS document) testing	**Total** 15 Hours **Theory:** 3 Hours **Practical:** 12 Hours	Computer Systems as per requirements Android Studio Multimedia projector Printer Internet USB Paper, Pencil, Erasers White Boards Markers Dusters	Classrooms, IT lab or visit to Software Industry

LU6: **Execute a Project**	**The trainee will be able to:** Deploy project in production environment as per client requirement. Perform user acceptance test as per client requirements	Deploy developed project on play store Perform user Acceptance testing as per client requirements	**Total** 10 Hours **Theory:** 3 Hours **Practical:** 7 Hours	Computer Systems as per requirements Android Studio Multimedia projector Printer Internet USB Paper, Pencil, Erasers White Boards Markers Dusters	Classrooms, IT lab or visit to Software Industry

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Module-29
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Module 29: 0613001029 Apply Design Pattern for Android App

Objective of the module:

This competency standard will provide skills and knowledge about the application of Design pattern for Android App. Learners will be able to identify the Basic of design pattern for Android App and its implementation. The learners will be able to implement and test design pattern for android app.

Duration:70 Hours **Theory: 15 Hours** **Practical: 55 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Identify the Basic of Design Pattern for Android App**	**The trainee will be able to:** Identify design pattern for android APP Identify relevant design pattern as per requirement	Introducing design pattern Explaining types of design pattern • Creational Design Pattern • Structural Design Pattern • Behavioral Design Pattern Introducing material design pattern Introducing MVC (Model-View-Controller) Pattern. Introducing MVP (Model-View-Presenter) Pattern. Introducing to MVVM (**Model - View – View Model**) Pattern Explaining design patterns in connection with android apps development	**Total:** 18 Hours **Theory:** 8 Hours **Practical:** 10 Hours	Multimedia projectors, White Board, White Board Markers, Internet Browsers, Android Studio, emulators or Android phone	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom
LU2:	**The trainee will be able**		**Total:**	Multimedia projectors, White	Computer Lab equipped with

Implement Design Pattern for android app	**to:** Build appropriate design pattern as per requirements Implement selected design pattern as per structure	Implementing the following design patterns for android app: • Material design pattern • MVC (Model-View-Controller) MVP (Model-View-Presenter) Pattern. • MVVM (**Model - View – View Model**) Pattern Evaluating android app with design patterns	34 Hours **Theory:** 4 Hours **Practical:** 30 Hours	Board, White Board Markers, Internet Browsers, Android Studio, emulators or Android phone	networking facility, electricity backup and internet connectivity. Classroom
LU3: **Test Design pattern for android App**	**The trainee will be able to:** Implement J-Unit Testing with MOCKITO for activity Implement fragment scenario testing for fragment	Describing MOCKITO for Junit testing Describing ESPRESSO framework for User Interface (UI) testing	**Total:** 18 Hours **Theory:** 3 Hours **Practical:** 15 Hours	Multimedia projectors, White Board, White Board Markers, Internet Browsers, Android Studio, emulators or Android phone MOKITIO, ESPRESSO	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

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Module-30
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Module 30: 0613001030 Develop Professional Android App

Objective of the module:

This competency standard enables the learner to manage and control the version system. After completion of this competency standard learner will be able to develop Android App using Web API's and Advance Interface Design.

Duration: 50 hours **Theory: 10 hours** **Practical: 40 hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Apply Version Control System**	**The trainee will be able to:** Create repository in third party cloud platform (GitHub) for version controlling Commit the code to the cloud for version control management as per specification	Briefing about online cloud platforms. Creating online clouds for users Briefing about version control repository. Creating repository in third party cloud like bit bucket and GitHub any other products similar to it Explaining techniques such as push, pull and merge etc. Applying sub techniques like push pull and merge.	**Total** 7 Hours **Theory:** 2 Hours **Practical:** 5 Hours	Paper, pencil, erasers, Markers, Flip chart/white board, pen Rulers, Laptops/ desktops as per requirements, Microsoft Word, Printer, Multimedia	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

	Create team in cloud for centralized Project	Creating branches to distribute work amongst team members Handing over rights to team e.g. read, write, admin etc. Merging of branches to the main repository			
LU2: **Develop Android App using Web API's**	**The trainee will be able to:** Create new project in android studio Create network layer between mobile and web API's Integrate android app with Web API's for data communications • Check Web API's Compatibility • Verify Web	Creating a new project in the android studio Setting up repository from third party cloud platform. Explaining API (Applications Programming Interface) Explaining various network connection methods Creating packages in android studio such as initialization for connecting web API's with android app, requesting web API's, exception handling for web API's etc. Explaining Functionality (GET, POST) and postman Explaining REST (Representational State Transfer) Enlightening SOAP (Simple Object Access Protocol) API Explaining JSON (Java Scripts Object	**Total** 24 Hours **Theory:** 6 Hours **Practical:** 18 Hours	Paper, pencil, erasers, Markers, Flip chart/white board, pen Rulers, Laptops/ desktops as per requirements, Microsoft Word, Printer, Multimedia	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

	API's working • Apply "Get" and "post" methods for communication with API's Use Network communication libraries (volley, Retrofit).	Notation) Elaborating XML (Extensible Markup Language) Explaining server errors Evaluating web API's using postman etc. Integrating "Get" , "Post" and "PUT" methods, requesting established libraries (volley, retrofit) for network layer to communicate with web API's in android studio			
LU3: **Develop Advance Interface Design**	**The trainee will be able to:** Develop design using up-to-date design software as per requirement Select appropriate layout mode using Android Studio as per specification Implement design for different screens using Android Studio as per	Explaining up to date design software for android application development such as adobe XD any other products similar to it Making new design using interactive software e.g. Adobe XD any other products similar to it Evaluating the newly created design Explaining complex layout Implementing layouts for android app such as constraint layout, relative layout etc. Explaining different screen resolutions Explaining specific resource folder management	**Total** 19 Hours **Theory:** 2 Hours **Practical:** 17 Hours	Paper, pencil, erasers, Markers, Flip chart/white board, pen Rulers, Laptops/ desktops as per requirements, Microsoft Word, Printer, Multimedia, Adobe XD	Computer Lab equipped with networking facility, electricity backup and internet connectivity. Classroom

	requirement Check Compatibility for portrait and landscape mode	Creating layout for different screen sizes such as layout- small, layout-large, layout-xlarge etc Adding images for different screen sizes such as drawable-MDPI, drawable-HDPI, drawable-XHDPI etc. Adding support manifest for all screens such as android: small screens/normal screens/ large screens etc, android: any density. Implementing design for different screens using dimens.XML Evaluating the compatibility for portrait and landscape modes using different virtual and physical devices.			

ANDROID APPLICATION DEVELOPER

Module-31

CBT Curriculum

National Vocational Certificate Level 4

Version 1 - November 2019

Module 31: 0613001031 Assure the Quality of Mobile App

Objective of the module:

This competency standard enables learner to prepare test cases for Application Programming Interface. Learner will be able to execute test cases and Assure Quality of Mobile App.

Duration:50 Hours **Theory:10 Hours** **Practical: 40 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Prepare test cases**	**The trainee will be able to:** Create functional test cases as per user requirements Create non-functional test cases as per user requirements Create unit test cases as per user requirements Create system test cases as per specification	Understanding functional testing concepts such as mainline functions, basic usability, accessibility, error conditions etc. Formation of functional test cases from SRS document. Understanding non-functional testing concepts such as performance, scalability, capacity etc. Formation of non-functional test cases from SRS document. Understand Unit Testing and its concepts such as: • Statement Coverage • Decision Coverage • Branch Coverage • Condition Coverage	**Total:** 17 Hours **Theory:** 1 Hours **Practical:** 16 Hours	• Whiteboards & Markers • Android Studio • Android Emulator • Microsoft Excel	Computer Lab equipped with networking facility, electricity backup and internet connectivity, Classroom

	Create integration test case as per the required specification Create regression test cases as per given requirements Create beta test cases as per user requirements Create interface test cases as per given design	Understanding the importance of system testing Understanding the types of system testing such as: Usability Testing, Recovery Testing, Regression Testing, Performance Testing etc. Understanding the significance of integration testing Approaches of Integration Testing such as: Big bang approach, top down approach, bottom up approach, sandwich approach etc. Understanding the need of regression testing Selection criteria for a test case to be in regression testing Difference between alpha and beta testing Strategies for beta testing such as public beta testing, focused beta testing etc. Understanding user			

		interface testing approaches Introducing user interface testing tool			
LU2: **Execute Test Cases**	**The trainee will be able to:** Perform functional testing as per user requirements Perform non-functional testing as per user requirements • Perform unit test Cases as per requirements • Perform system test cases as per specification • Perform integration test case as per the required specification Perform regression test cases as per given requirements	Understanding Application Core Functionalities, Application Flow, Features and related implementations. test case execution phases such as: selection of test suite to execute, status reporting and bug reporting etc. Understanding debugging, compile time, run-time errors, Android OS errors, emulator integrations and executions.	**Total:** 17 Hours **Theory:** 4 Hours **Practical:** 13 Hours	• Whiteboards & Markers • Android Studio • Android Emulator	Computer Lab equipped with networking facility, electricity backup and internet connectivity, Classroom

	• Perform beta test case as user requirements • Execute interface test cases as per given design.				
LU3: **Comply with Privacy Policy of App**	**The trainee will be able to:** Comply with GDPR (General Data Protection Regulations) Policy Ensure the Standards of Mobile App according to GDPR	Understand importance of implementing Privacy Policy and related roles and procedures. Understand approaches to ensure GDPR compliance such as: data mapping of your application, cookie consent etc.	**Total:** 16 Hours **Theory:** 5 Hours **Practical:** 11 Hours	Whiteboards & Markers • Web browser (Chrome) • Internet	Computer Lab equipped with networking facility, electricity backup and internet connectivity, Classroom

ANDROID APPLICATION DEVELOPER

Module-32
CBT Curriculum
National Vocational Certificate Level 4

Version 1 - November 2019

Module 32: 0613001032 Develop Professionalism Capable of Android Development

Objective of the module:

In this competency standard learners will be able to develop professional, social and entrepreneurial skills that will facilitate them for choosing a better career path and professional growth. After completing this competency standard learner will be able to develop freelance business and expand professional network through different means.

Duration: 50 Hours **Theory: 10 Hours** **Practical: 40 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: **Develop Employability Skills**	**The trainee will be able to:** Develop technical introduction and related portfolio. Participate in interpersonal activities • Group discussions • Team Competitions Organize internal activities to improve employability skills Develop a career goal	Learn to showcase professional skills, achievements, technical qualifications and interpersonal skills. Understand importance of teamwork, technical collaboration, mentoring and training activities. Learn oral/written communication, adaptability and professional personality traits. Understand the importance of right career choices, market trends and in-demand skills.	**Total** 20 Hours **Theory:** 5 Hours **Practical:** 15 Hours	Computer Systems as per requirements Internet Chrome Web Browser Papers Pencils	Classrooms Computer Labs

LU2: **Develop Freelance Business**	**The trainee will be able to:** Develop a profile on Upwork/Fiver with portfolio. Develop business communication skills required for android development field • Proposals • e-mails • Tools like Skype, Slack & Zoom etc. Schedule a mockup client /freelancer interview session	Learn freelancing platforms like Upwork, Fiver, technical introduction and qualification with portfolio. Learn technical writing (emails, job proposals, status updates) and digital communication tools like Skype, Slack and Zoom. Learn to communicate online, verbal introduction to showcase employability skills.	**Total** 15 Hours **Theory:** 3 Hours **Practical:** 12 Hours	Computer Systems as per requirements Internet Skype Slack Zoom Chrome Web Browser Papers Pencils	Classrooms Computer Labs
LU3: **Expand Professional Network**	**The trainee will be able to:** Create a Linked-In profile and expand professional network. Create a Mobile App Development blog and share it online. Create a Professional Resume with portfolio, experience and blogging info.	Learn professional social interaction, network building and job searching skills. Learn technical writing, online blogging, sharing and social networking. Learn to create a professional resume, importance of social presence and portfolio building.	**Total** 15 Hours **Theory:** 2 Hours **Practical:** 13 Hours	Computer Systems as per requirements Internet Chrome Web Browser Paper Pencils	Classrooms Computer Labs

General assessment guidance for *Android Application Developer*

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

Sessional assessment is going on all the time. Its purpose is to provide feedback on what students are learning:

- To the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

Final assessment is the assessment, usually on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student’s performance.

Examples for direct assessment of Android Application Developer include:

- Work performances, for example making a program in PLC for a particular application and designing with external interfaces (Mobile Phone Devices)
- Work performances by developing an android application and then installing it on an emulator.
- Work performances by developing an android application and then installing it on a mobile phone then checking its performance.

- Work performances, for example uploading the developed app on social media such as play store and then checking the feedback of the users).
- Work performance by assigning a project by the examiner.
- Work performance by checking the previously developed and uploaded android apps during the training session.
- Direct questioning, where the assessor would ask the student why he is preparing ~~for~~ a particular application.
- .Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of Android Application Developer include:

- Submission of already developed App
- Portfolio of work etc.

Indirect assessment should only be a second choice. (In some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that a valid assessment assesses what it claims to assess for example, if complex android app needs to be developed, the assessment should be involved according to performance criteria that are directly related to that particular App. Use of already developed App would not meet the performance criteria.

Reliability means that the assessment is consistent and reproducible. The results for the particular application should be the same.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

Assessment strategy for *Android Application Developer*

This Curriculum consists of 13 Modules:

- Module 20: Contribute to Work Related Health and Safety (WHS) Initiatives
- Module 21: Analyze Workplace Policy and Procedures
- Module 22: Perform Advanced Communication
- Module 23: Develop Advance Computer Application Skills
- Module 24: Manage Human Resource Services
- Module 25: Develop Entrepreneurial Skills
- Module 26: Undertake Research & Planning for Apps Development
- Module 27: Develop and Analyse Algorithm for Coding
- Module 28: Develop Software Development Life Cycle (SDLC) for Apps Development
- Module 29: Apply Design Pattern for Android App
- Module 30: Develop Professional Android App
- Module 31: Assure the Quality of Mobile App
- Module 32: Develop Professionalism Capable of Android Development

Sessional assessment

The Sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The Sessional marks shall contribute to the final qualification.

Theoretical assessment for all learning modules must consist of a written paper lasting at least one hour per module. This can be a combination of multiple choice and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final assessment

Final assessment shall be in two parts: theoretical assessment and practical assessment. The final assessment marks shall contribute to the final qualification.

The final theoretical assessment shall consist of half multiple choice and half short-answer questions. This part shall cover the technical, functional and generic modules:

. For the final practical assessment of Level -4 assessments, each student shall be assessed over a period of two days, with Four hour sessions on each day. This represents a total of two sessions totaling 8 hours of practical assessment for each student. During this period, each student must be assessed on his/her ability to the following parameters of Android Application Developer;

- Designing
- Configuration
- Installation
- Interfacing
- Programming
- Operating
- Controlling
- Monitoring

There is no final practical assessment Module 20: Contribute to Work Related Health and Safety (WHS) Initiatives, Module 21: Analyze Workplace Policy and Procedures, Module 22: Perform Advanced Communication, Module 23: Develop Advance Computer Application Skills, Module 24: Manage Human Resource Services, Module 25: Develop Entrepreneurial Skills. Practical work for these modules shall be assessed on a sessional basis only.

The assessment team

The number of assessors must meet the needs of the students and the training provider. For example, where two assessors are conducting the assessment, there must be a maximum of five students per assessor. In this example, a group of 20 students who requires four assessors shall therefore require assessments to be carried out over a day period. For a group of only 10 students if assessed by two assessors, assessments would be carried out over a day period only.

Planning for assessment

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. The tables on the following pages under assessment packages are for assessors to use to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules into a cohesive two-day final assessment programme for each group of five students. Training providers must agree the dishes for practical assessments in advance.

Complete list of tools and equipment

Tools and Equipment Required

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

Sr#	Description	Quantity
Consumable		
1.	Paper	A4 Rim (As per requirement)
2.	Pencils	25
3.	Chart	As per requirement
4.	Color Pencils	25 sets
5.	Sharpener	25
6.	Eraser	25
7.	Note Book	1
Non-Consumable		
8.	Computer	25
9.	Internet Connection	In all Computers
10.	Software: • Web Browser • MS Office	In all Computers
11.	Notepad++	Per each computer
12.	Net Beans	Per each computer
13.	Computer system	25
14.	Multimedia Projector	01

15.	USB/Memory Stick	01
16.	Internet	As per required
17.	Android Studio	As per requirement
18.	Android SDK (Software Development Kit)	As per requirement
19.	MS Access, SQLite Browser	As per requirement
20.	Adobe XD	1
21.	Visio	1
22.	Printer	01
23.	Scanner	01
24.	Software DVD’s	25
25.	Computer System (Ref: Minimum SSD 240, 8GB RAM)	As per software requirement
26.	Computer Software (JDK, Android Studio)	As per requirement
27.	Network Printer	1
28.	MS Word	As per requirement
29.	Web Browser (chrome/Firefox etc.)	
30.	Computer system	25
31.	Multimedia Projector	01
32.	Visio Computer Software	1
33.	JIRA	For each computer
34.	Android Data cable for connectivity	As per requirements
35.	Graphic Design Software (Adobe XD etc.)	25
36.	Emulator	For each computer

37.	Software Testing Tools (Appium, Robotium)	For each computer
38.	Android Phones	As per requirements
39.	Android Data cable for connectivity	As per requirements
40.	Networks Switches,	As per requirements
41.	Network Cable cat-6,	As per requirements
42.	RJ-45 connectors,	As per requirements
43.	Cable Testers,	As per requirements
44.	Crimpling tools	As per requirements

Credit values

The credit value of the National Certificate Level -2, Level-3 and Level-4 in Android Application Developer is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines.

The credit values are as follows:

Competency Standard	**Estimate of hours**	**Credit**
T: Contribute to Work Related Health and Safety (WHS) Initiatives	30	3
U: Analyze Workplace Policy and Procedures	30	3
V: Perform Advanced Communication	30	3

Competency Standard	Estimate of hours	Credit
W: Develop Advance Computer Application Skills	40	4
X: Manage Human Resource Services	20	2
Y: Develop Entrepreneurial Skills	30	3
Z: Undertake Research & Planning for Apps Development	20	2
AA: Develop and Analyse Algorithm for Coding	40	4
BB: Develop Software Development Life Cycle (SDLC) for Apps Development	120	12
CC: Apply Design Pattern for Android App	70	7
DD: Develop Professional Android App	50	5
EE: Assure the Quality of Mobile App	50	5
FF: Develop Professionalism Capable of Android Development	50	5

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