Government of Pakistan

National Vocational and Technical Training Commission

Prime Minister Youth Skills Development Program

"Skills for All"

Course Contents / Lesson Plan
Course Title: Android Java
Duration: 3 Months

Trainer Name	
Author Name	
Course Title	**Android Java + Database**
Objectives and Expectations	**Employable skills and hands-on practice in Android Java + Database** **Objective:** The objective of this course is to equip participants with the essential skills and knowledge required to develop robust Android applications using Java programming language and effectively integrate databases into their applications. By the end of the course, participants should be proficient in building Android apps, understanding database concepts, and implementing database operations within Android applications. **Expectations:** **i.** **Understanding of Java Programming:** Participants will gain a solid understanding of Java programming language fundamentals, including variables, data types, control flow, methods, and object-oriented programming principles. **ii.** **Android Development:** Participants will learn to develop Android applications using Java, covering topics such as user interface design, activities, intents, fragments, services, and broadcast receivers. **iii.** **Database Integration:** Participants will learn how to integrate various types of databases, such as SQLite, Firebase Realtime Database, or Room Persistence Library, into Android applications. They will understand concepts like database creation, querying, updating, and deleting data. **iv.** **Hands-on Practice:** The course will provide ample hands-on practice opportunities through coding exercises, projects, and assignments. Participants will build real-world Android applications that involve database integration to reinforce their learning. **v.** **Troubleshooting Skills:** Participants will develop troubleshooting skills to identify and resolve common issues encountered during Android app development and database integration. **Employable Skills:** **i.** **Android App Development:** Participants will acquire the skills necessary to develop Android applications, making them employable as Android developers in various industries. **ii.** **Database Management:** Understanding database concepts and practical experience in integrating databases into Android apps will make participants valuable assets in roles requiring database management skills. **iii.** **Problem-Solving:** Through hands-on practice and troubleshooting exercises, participants will enhance their problem-solving abilities, a crucial skill sought after by employers in the tech industry.

	iv. **Team Collaboration:** Collaborative projects and group activities will foster teamwork and communication skills, preparing participants for collaborative work environments. v. **Continuous Learning:** The course will instill a mindset of continuous learning, essential in the fast-paced field of technology, where new tools and frameworks regularly emerge. **Hands-on Practice:** i. **Building Android Applications:** Participants will create various types of Android applications, including simple utility apps, multimedia apps, and networking apps, to gain practical experience in Android development. ii. **Database Implementation:** Participants will implement databases into their Android applications, performing tasks such as creating database schemas, performing CRUD (Create, Read, Update, Delete) operations, and handling data synchronization. iii. **Project Work:** Participants will work on individual and group projects that involve developing Android applications with database integration. These projects will allow participants to apply their skills to real-world scenarios and build a portfolio to showcase to potential employers. iv. **Code Reviews and Feedback:** Regular code reviews and feedback sessions will provide participants with constructive criticism to improve their coding practices and application development skills.
Entry-level of trainees	For an advanced course of Android Java + Database proposed entry level is minimum bachelors in relevant subject, so expectations from the trainees are: • Basic understanding of programming concepts. • Familiarity with computer systems and operating systems. • No prior knowledge of Android development or Java is required
Learning Outcomes of the course	**The content of this lesson plan is adopted from the internationally recognized ISTQB certification course, "Certified Tester Foundation Level (CTFL)," ensuring alignment with global standards and practices. For further reference, the link to the source material is provided below:** **Develop functional Android applications:** • Design and implement user interfaces using layouts and various UI components. • Integrate SQLite databases for data storage and retrieval. • Perform CRUD operations (Create, Read, Update, Delete) efficiently using Room persistence library. • Consume APIs and interact with web services. • Implement essential features like location services, sensors, and multimedia. **Master Java programming for Android:** • Write clean, efficient, and object-oriented Java code adhering to best practices. • Understand core language concepts like data types, control flow, object-oriented principles, and collections. • Apply Java APIs specifically designed for Android development.

	Work with Android development tools and frameworks: • Utilize Android Studio as the primary development environment. • Understand the Android SDK structure and its components. • Leverage Android libraries and frameworks like Material Design and Jetpack. **Implement security best practices:** • Understand common security vulnerabilities in Android apps. • Secure user data and handle authentication processes effectively. • Follow guidelines for secure coding and data encryption. **Proficiency in Java Programming:** • Participants will demonstrate proficiency in Java programming language, including variables, data types, control flow, methods, and basic object-oriented programming principles. **Understanding of Android Development:** • Participants will understand the fundamentals of Android app development, including the Android Studio IDE, user interface design, activities, intents, fragments, services, and broadcast receivers. **Database Integration Skills:** • Participants will be able to integrate various types of databases, such as SQLite, Firebase Realtime Database, or Room Persistence Library, into Android applications. • They will understand how to create database schemas, perform CRUD (Create, Read, Update, Delete) operations, and handle data synchronization. **Application Building Skills:** • Participants will be capable of building Android applications from scratch, incorporating user interfaces, application logic, and database functionality. **Troubleshooting and Debugging:** • Participants will develop troubleshooting and debugging skills to identify and resolve common issues encountered during Android app development and database integration.
Course Execution Plan	The total duration of the course: **3 months (12 Weeks)** Class hours: **4 hours per day** Theory: **20%** Practical: **80%** Weekly hours: **20 hours per week** Total contact hours: **240 hours**
Companies offering jobs in the respective trade	• Trillium • Afinity • Net Sole • I2c • Multinet • Nescom • Transworld • Netcom • Systems

	• Web Work Solution • Purelogics • Nets-International • Ebryx
Job Opportunities	• Mobile App Development • Android Developer • Enterprise Mobile Solutions • Mobile Backend Engineer • Game Development • Emerging Technologies • Database Administrator • System Analyst
No of Students	25
Learning Place	Classroom / Lab
Instructional Resources	**Online Courses and Tutorials:** 1. Intro to Android Development with Kotlin: https://www.udacity.com/course/android-kotlin-developer-nanodegree--nd940 2. Android Basics with Java: https://developer.android.com/courses 3. The Complete Android & Java Developer Course: https://www.udemy.com/course/complete-android-course/ 4. Android App Development Specialization: https://www.coursera.org/specializations/android-app-development 5. Launch your career as an Android app developer. Build job-ready skills for an in-demand career and earn a credential from Meta. No degree or prior experience required to get started. Meta Android Developer Professional Certificate: https://www.coursera.org/professional-certificates/meta-android-developer **Books and References:** 1. Head First Android Development (David Griffiths and Dawn Griffiths): https://www.amazon.com/Head-First-Android-Development-Brain-Friendly/dp/1491974052 2. The Big Nerd Guide (Brian Kernighan and Bill Joy): https://bignerdranch.com/books/ 3. Pro Android Kotlin (Mark Murphy): https://www.amazon.com/Pro-Android-Kotlin-Developing-Jetpack/dp/1484287444 4. Official Android Documentation: https://developer.android.com/develop

	Practice and Experimentation: 1. Android Studio: https://developer.android.com/studio 2. GitHub: https://github.com/index

MODULES

Scheduled Weeks	Module Title	Days	Hours	Learning Units	Home Assignment
Week 1	**Introduction to Android Development**	**Day 1**	**Hour 1-2**	**Introduction to Android** • Overview of Android OS • Android Studio Installation • Setting up the development environment	
			Hour 3-4	**Basic Android Concepts** • Activities, Views, and Layouts • User Interface (UI) components	
		Day 2	**Hour 1-2**	**User Interface Design** • XML Layouts • UI Widgets and Event Handling	
			Hour 3-4	**Android Project Structure** • Understanding project files and directories • Resources and asset management	

		Day 3	**Hour 1-2**	**Intents and Activity Lifecycle** • Explicit and Implicit Intents • Handling Activity lifecycle events	
			Hour 3-4	**Fragments** • Introduction to fragments • Fragment lifecycle and communication	
		Day 4	**Hour 1-2**	**Recycler View and Adapters** • Displaying lists efficiently • Creating custom adapters	
			Hour 3-4	**Android Networking** • Making HTTP requests • Handling JSON data	
		Day 5	**Hour 1-2**	**Basic Android Animation** • Animating UI components • Transition and Property Animations	
			Hour 3-4	**Task and Project Discussion** • Assigning tasks and discussing the course project • Clarifying doubts and questions	

Week 2	**Introduction to Android Development**	**Day 1**	**Hour 1-2**	**SQLite Database Basics** • Creating and managing databases • CRUD operations with SQLite	
			Hour 3-4	**SQLite Open Helper and Content Providers** • Database schema upgrades • Sharing data between apps	
		Day 2	**Hour 1-2**	**Room Database** • Introduction to Android Room • Entity, DAO, and Database setup	
			Hour 3-4	**Live Data and View Model** • Implementing Live Data • Using View Model to manage UI-related data	
		Day 3	**Hour 1-2**	**Working with Shared Preferences** • Storing and retrieving simple data • Use cases for Shared Preferences	
			Hour 3-4	**Content Providers** • Understanding content providers • Implementing a content provider	

		Day 4	**Hour 1-2**	**Implementing CRUD Operations with Room** • Creating, Reading, Updating, and Deleting data • Handling database transactions	
			Hour 3-4	**Recycler View with Database** • Loading data from a database into Recycler View • Updating UI based on database changes	
		Day 5	**Hour 1-2**	**Firebase Realtime Database** • Introduction to Firebase • Real-time data synchronization	
			Hour 3-4	**Firebase Authentication** • Implementing user authentication • Securing data with Firebase rules	
Week 3	**Advanced Android Development and Project Work**	**Day 1**	**Hour 1-2**	**Advanced UI Components** • Custom Views and ViewGroups • Material Design principles	
			Hour 3-4	**Background Processing** • Async Task and Async Task Loader • Using Services for background task	

		Day 2	**Hour 1-2**	**Location-Based Services** • Integrating Google Maps • Accessing device location	
			Hour 3-4	**Camera Integration** • Capturing photos and videos • Handling camera permissions	
		Day 3	**Hour 1-2**	**App Security** • Securing data storage • Implementing secure authentication	
			Hour 3-4	**Testing and Debugging** • Unit testing with JUnit • Debugging techniques	
		Day 4	**Hour 1-2**	**App Optimization and Performance** • Profiling and optimizing code • Memory management techniques	
			Hour 3-4	**Publishing an App** • Preparing an app for release • Uploading to the Google Play Store	

		Day 5	**Hour 1-4**	**Project Work and Consultation** • Individual project work • Consultation and feedback	
Week 4	**Advanced Android Development and Project Work**	**Day 1-5**	**Hours 1-4**	**Project Development and Implementation** • Guided project development sessions • Troubleshooting and support	
Week 5	**Android Networking and APIs**	**Day 1**	**Hour 1-2**	**RESTful APIs** • Understanding REST architecture • Making API requests with Retrofit	
			Hour 3-4	**JSON Parsing** • Parsing JSON responses • Handling nested JSON structures	
		Day 2	**Hour 1-2**	**OAuth and Authentication** • Implementing OAuth for secure authentication • User authorization with OAuth	
			Hour 3-4	**Consuming Third-Party APIs** • Integration with external APIs • Use cases and best practices	

		Day 3	**Hour 1-2**	**WebSocket Communication** • Real-time communication with WebSocket • Implementing a chat application	
			Hour 3-4	**Background Sync with Work Manager** • Scheduling background tasks • Implementing periodic sync	
		Day 4	**Hour 1-2**	**Offline Mode and Caching** • Implementing offline mode • Using caching mechanisms	
			Hour 3-4	**Firebase Cloud Messaging** • Push notifications with FCM • Handling notification messages	
		Day 5	**Hour 1-4**	**Project Work and Consultation** • Individual project work • Consultation and feedback	

Week 6	**Android Networking and APIs**	**Day 1-5**	**Hour 1-4**	**Project Development and Implementation** • Guided project development sessions • Troubleshooting and support	
Week 7	**Advanced Database Concepts and Deployment**	**Day 1**	**Hour 1-2**	**Advanced Room Database** • Migrations and versioning • Database optimization techniques	
			Hour 3-4	**Full-text Search with SQLite** • Implementing search functionality • Utilizing SQLite full-text search	
		Day 2	**Hour 1-2**	**NoSQL Databases for Android** • Introduction to MongoDB and Firebase Firestore • Integration and use cases	
			Hour 3-4	**Room Database Encryption** • Implementing database encryption • Securing sensitive data	
		Day 3	**Hour 1-2**	**Realm Database** • Introduction to Realm • Setting up and integrating Realm	

			Hour 3-4	**Data Migration Strategies** • Handling data migration in databases • Versioning and compatibility	
		Day 4	**Hour 1-2**	**Multi-threading with Room** • Implementing multithreading for database operations • Background tasks and performance	
			Hour 3-4	**Content Providers and Sync Adapters** • Implementing a content provider with sync adapter • Synchronizing data with the server	
		Day 5	**Hour 1-4**	**Project Work and Consultation** • Individual project work • Consultation and feedback	
Week 8	**Advanced Database Concepts and Deployment**	**Day 1-5**	**Hour 1-4**	**Project Development and Implementation** • Guided project development sessions • Troubleshooting and support	
Week 9	**Advanced Topics in Android Development**	**Day 1**	**Hour 1-2**	**Custom Views and Drawing** • Creating custom UI components • Drawing on the Canvas	

				Vulnerability Scanning and Enumeration	
			Hour 3-4	**Android Sensors** • Integrating sensors like accelerometer and gyroscope • Implementing sensor-based features	
		Day 2	**Hour 1-2**	**Augmented Reality (AR) on Android** • Introduction to ARCore • Implementing AR features	
			Hour 3-4	**Android Accessibility** • Making apps accessible to all users • Implementing accessibility features	
		Day 3	**Hour 1-2**	**Location-Based Services with Maps API** • Advanced usage of Google Maps API • Implementing location-based features	
			Hour 3-4	**Android App Widgets** • Creating and updating app widgets • Best practices for widget development	

		Day 4	**Hour 1-2**	**Android Background Services** • Creating long-running background services • Managing background tasks efficiently	
			Hour 3-4	**Android App Security Best Practices** • Securing data storage and transmission • Protecting against common security threats	
		Day 5	**Hour 1-4**	**Project Work and Consultation** • Individual project work • Consultation and feedback	
Week 10	**Advanced Topics in Android Development**	**Day 1-5**	**Hour 1-4**	**Project Development and Implementation** • Guided project development sessions • Troubleshooting and support	
Week 11	**Deployment, Testing, and Advanced Concepts**	**Day 1**	**Hour 1-2**	**Firebase Cloud Functions** • Implementing serverless functions • Integrating with Firebase features	

			Hour 3-4	**Android Testing Frameworks** • Unit testing with JUnit and Mockito • UI testing with Espresso	
		Day 2	**Hour 1-2**	**Continuous Integration and Deployment** • Setting up CI/CD pipelines • Automated testing and deployment	
			Hour 3-4	**Android Jetpack Compose** • Introduction to Jetpack Compose • Building UI with the modern Android toolkit	
		Day 3	**Hour 1-2**	**Android Instant Apps** • Introduction to Instant Apps • Building and deploying instant experiences	
			Hour 3-4	**Android TV and Wear OS Development** • Developing apps for TV and wearables • Designing for different form factors	

		Day 4	**Hour 1-2**	**Advanced Dependency Injection with Dagger** • Implementing dependency injection in Android • Using Dagger for efficient DI	
			Hour 3-4	**Android Enterprise Development** • Developing apps for enterprise use • Implementing device management features	
		Day 5	**Hour 1-4**	**Final Project Refinement and Presentation Preparation** • Refining the final project • Preparing for the project presentation	
Week 12	**Deployment, Testing, and Advanced Concepts**	**Day 1-5**	**Hour 1-4**	**Final Project Presentations and Graduation** • Each student presents their final project • Graduation ceremony and distribution of certificates	

Practical Tasks:

	Task	Description	Week
1	**Setting up Android Studio and Create a Basic Android App**	● Familiarize yourself with Android development tools Create your first Android project using Android Studio	Week 1
2	**Designing a Simple User Interface**	● Learn about XML layouts and UI components in Android Development ● Create a basic user interface with text views, edit texts, and buttons.	Week 2
3	**Building a Multi-Screen App**	● Create multi-screen apps using activities, fragments, and intents in Android.	Week 3
4	**Implement Dynamic Lists and Customizing UI Elements**	● Implement dynamic lists using RecyclerView ● Customize UI elements and themes to enhance the visual appeal of your app	Week 4
5	**Building a Multi-Screen Android App with Customized UI**	• Apply the concepts learned in the previous weeks to develop a multi-screen Android application with a customized user interface (UI). • Create a fully functional app that incorporates multiple screens, each serving a specific purpose, and customize the UI to enhance the user experience.	Week 5
6	**Setting up SQLite Database in Android**	● Learn about databases Integrate SQLite into an Android application.	Week 6
7	**Performing CRUD Operations with SQLite**	● Focus on creating, reading, updating, and deleting (CRUD) operations in SQLite databases within Android applications.	Week 7
8	**Implement Database Operations with Room**	● Learn about Room Persistence Library, an abstraction layer over SQLite ● Implement database operations	Week 8

		using Room in Android.	
9	**Handling Transactions and Complex Queries**	● Focus on advanced database concepts such as transactions, handling conflicts ● Work with multiple tables and complex queries	Week 9
10	**Integrating SQLite and Room into a Complex Android App**	● Integrate SQLite and Room databases into a complex Android application that involves multiple screens and features	Week 10
11	**Implementing Background Services and Task Scheduling**	● Learn about background processing in Android ● Implement background services to perform tasks independently of the main application thread Explore JobScheduler for scheduling tasks	Week 11
12	**Integrating Networking and RESTful APIs**	● Integrate networking capabilities into your Android app to communicate with remote servers and consume data from RESTful APIs Learn about making network requests, parsing JSON responses, and integrating RESTful APIs.	Week 12
13	**Implementing Location-Based Features and Integrating Google Maps**	● Learn about location-based services in Android and integrate Google Maps into your app to display ● Interact with maps and location data.	Final Exam
14	**Managing App Permissions and Implementing Secure Coding Practices**	● Learn about managing app permissions in Android ● Implement secure coding practices to protect your app from security vulnerabilities	Final Exam
15	**Testing, Building, and Deploying Android Apps**	● Learn about testing methodologies in Android development ● Write unit tests and UI tests for your app ● Build and deploy your Android app to the Google Play Store.	Final Exam

Annexure-IV:

Workplace/Institute Ethics Guide

Work ethic is a standard of conduct and values for job performance. The modern definition of what constitutes good work ethics often varies. Different businesses have different expectations. Work ethic is a belief that hard work and diligence have a moral benefit and an inherent ability, virtue, or value to strengthen character and individual abilities. It is a set of values-centered on the importance of work and manifested by determination or desire to work hard.

The following ten work ethics are defined as essential for student success:

1. **Attendance:**
   Be at work every day possible, plan your absences don't abuse leave time. Be punctual every day.
2. **Character:**
   Honesty is the single most important factor having a direct bearing on the final success of an individual, corporation, or product. Complete assigned tasks correctly and promptly. Look to improve your skills.
3. **Team Work:**
   The ability to get along with others including those you don't necessarily like. The ability to carry your weight and help others who are struggling. Recognize when to speak up with an idea and when to compromise by blend ideas together.
4. **Appearance:**
   Dress for success set your best foot forward, personal hygiene, good manner, remember that the first impression of who you are can last a lifetime
5. **Attitude:**
   Listen to suggestions and be positive, accept responsibility. If you make a mistake, admit it. Values workplace safety rules and precautions for personal and co-worker safety. Avoids unnecessary risks. Willing to learn new processes, systems, and procedures in light of changing responsibilities.
6. **Productivity:**
   Do the work correctly, quality and timelines are prized. Get along with fellows, cooperation is the key to productivity. Help out whenever asked, do extra without being asked. Take pride

in your work, do things the best you know-how. Eagerly focuses energy on accomplishing tasks, also referred to as demonstrating ownership. Takes pride in work.

7. **Organizational Skills:**

   Make an effort to improve, learn ways to better yourself. Time management; utilize time and resources to get the most out of both. Take an appropriate approach to social interactions at work. Maintains focus on work responsibilities.

8. **Communication:**

   Written communication, being able to correctly write reports and memos. Verbal communications, being able to communicate one on one or to a group.

9. **Cooperation:**

   Follow institute rules and regulations, learn and follow expectations. Get along with fellows, cooperation is the key to productivity. Able to welcome and adapt to changing work situations and the application of new or different skills.

10. **Respect:**

    Work hard, work to the best of your ability. Carry out orders, do what's asked the first time. Show respect, accept, and acknowledge an individual's talents and knowledge. Respects diversity in the workplace, including showing due respect for different perspectives, opinions, and suggestions.