GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester -V

Course Title: Mobile Application Development using Android
(Course Code: 4350703)

Diploma programme in which this course is offered	Semester in which offered
Computer Engineering	5ᵗʰ semester

1.   RATIONALE

Smartphones and mobile applications have grown in popularity in recent years. This trend is expected to continue, resulting in an increased demand for professionals who can create mobile applications. Android mobile application development is a relevant and important topic for computer engineering students because it allows them to apply their programming skills and knowledge to create real-world applications. The course provides students with hands-on experience in developing mobile applications using Android. This practical experience is essential for students to be able to apply the concepts they have learned in a real-world setting. This course will help students to build core competencies in mobile application development with relevant skills and knowledge, practical experience, and career opportunities in a growing and dynamic industry.

2.   COMPETENCY

The purpose of this course is to help the student to attain the following industry identified competency through various teaching-learning experiences:

- **Create effective Android Mobile Applications using standard technologies and innovative problem-solving skills.**

3.   COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge, and the relevant soft skills associated with this competency are to be developed in the student to display the following Course Outcomes (COs):

CO1. Develop Android applications using Android application Components and Life Cycle of Activity after setting up Android Development Environment.

CO2. Design Activity using Layouts and Widgets.

CO3. Apply Event Handling in Android application to perform user actions.

CO4. Develop Android Applications using Menu, Dialog, and Databases.

CO5. Develop Android applications using Kotlin Language.

4.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T/2+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA*	ESE	CA	ESE	

-	-	4	2	-	-	25	25	50

(*): For this practical only course, 25 marks under the practical CA has two components i.e. the assessment of micro-project, which will be done out of 10 marks and the remaining 15 marks are for the assessment of practical. This is designed to facilitate attainment of COs holistically, as there is no theory ESE

Legends: **L**-*Lecture;* **T** – *Tutorial/Teacher Guided Theory Practice;* **P** -*Practical;* **C** – *Credit,* **CA** - *Continuous Assessment;* **ESE** -*End Semester Examination.*

5.   SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the subcomponents of the COs. These PrOs need to be attained to achieve the COs.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Set-up of Android development environment, managing AVD and understanding its various components.	I	02
2	Understanding of Various Components available in Android Application	I	02
3	Develop a "Hello World" Application in Android and understand the structure of an Android Application	I	02
4	Develop Android Application to demonstrate methods of Activity Life Cycle.	I	02
5	Design Android Activities using LinearLayout, RelativeLayout, GridView, FrameLayout, and ConstraintLayout	II	06
6	Design various Activities using different Layouts and available Widgets(TextView, EditText, Button, RadioButton, CheckBox, ImageButton, ToggleButton, TimePicker, DatePicker, ProgressBar, ImageView) to make the user-friendly GUI.	II	04
7	Develop code to demonstrate different ways of Handling different events (onClick, onLongClick etc.) over Button, EditText etc. to perform action in Android application at run-time.	III	04
8	Develop code to demonstrate Event handling of CheckBox and RadioButton selection.	III	02
9	Develop code to navigate between different activities and pass the data from one activity to other activity using Intent.	III	02
10	Develop an android application to store data locally using SharedPreferences and access-modify in different activities.	III	02
11	Develop the code to implement the ListView and the Spinner views, perform add, update, remove items operations and implement the item selection event handling over ListView and Spinner for appropriate example.	III	04

12	Develop the code to manage Permission using Manifest file and run time from Activity, and toggle state of WiFi and Bluetooth.	III	02
13	Develop android applications to demonstrate user interaction with the application using Options Menu, Context Menu and Popup Menu.	IV	04
14	Develop Android Applications to demonstrate different AlertDialogs and the Custom Dialog.	IV	04
15	Develop Android Application for local database connectivity and performing basic database operations (select, insert, update, delete) using SQLiteDatabase and SQLiteOpenHelper Classes	IV	04
17	Develop an Android Application to demonstrate the use of RecyclerView and CardView for displaying list of items with multiple information	IV	04
18	Develop a simple application to display "Hello <Application Name>" using Kotlin	V	02
19	Develop an android application using Kotlin having a Button "Click" and upon clicking on that Button a Toast message "Button Clicked" should be displayed on screen through Toast Message	V	02
20	Publish an Android Application on Play Store	V	02
*	**Total**		**56**

Note

  i. _More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list**.**_

 ii. _The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency._

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Analyze the problem statement and propose/design the solution of the problem through the program	20
2	Correctness of the Program	30
3	Effective utilization of different components and various properties to generate Quality output.	20
4	Readability and Documentation of the Program	20
5	Answering various questions regarding the concept of the program	10
	Total	**100**

6.   MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

This major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to usher in uniformity of practical in all institutions across the state.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Computer with latest configuration with Windows/Linux/Unix Operating System	All
2	Android Studio	All

7. AFFECTIVE DOMAIN OUTCOMES

The following *sample* Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfill the development of this competency.

a) Work as an Android Application Developer.
b) Demonstrate working as a team leader/member.
c) Apply good Coding Practices using Coding Standards and Documentation.

The ADOs are best developed through laboratory exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

9. UNDERPINNING THEORY

Only the major Underpinning Theory is formulated as higher-level UOs of *Revised Bloom's taxonomy* in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher-level UOs could be included by the course teacher to focus on the attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – I **Basics of** **Android** **Development**	1.1 Understand the features of Android 1.2 Set up Android Development environment 1.3 Develop simple 'Hello World' Android Application 1.4 Demonstrate the Activity Life cycle	1.1.1 Android: An Open Platform for Mobile Development 1.1.2 Android SDK Features 1.1.3 Introducing the Open Handset Alliance 1.1.4 Introducing the Development Framework 1.2.1 Setting up Android Development Environment: ● Downloading and installing Android Studio ● Downloading and Installing the Android SDK ● Creating AVD ● Installing USB drivers and setup Developer modes in Android Device 1.3.1 Develop "Hello World" Android Application 1.4.1 Components of Android Application 1.4.2 Activity Life cycle

Unit – II Modelling GUI Using Android	2.1 Design the Activity using Layouts. 2.2 Use of views for designing activity.	2.1.1 Understanding the Views and ViewGroups 2.1.2 Layouts: ● LinearLayout ● RelativeLayout ● GridView ● FrameLayout ● ConstraintLayout 2.1.3 ScrollView and HorizontalScrollView 2.1.4 Units of Measurement: dp, sp, pt, px, in etc. 2.2.1 Basic Views: ● TextView, Button, ImageButton, ImageView, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup ● ProgressBar, Slider, RatingBar ● AutoCompleteTextView ● TimePicker, DatePicker ● ListView ● Customizing the ListView ● Spinner View
Unit– III Event Handling in Android Application	3.1 Implement User Event handling on Views 3.2 Implement the Intent for navigation between different activities 3.3 Use the shared preferences for storing user information 3.4 Understanding of Service Life cycle 3.5 Manage permissions	3.1.1 Handling User Events 3.1.2 OnClickListener of Views 3.1.3 OnLongClickListener 3.1.4 TextWatcher to handle the EditText text change 3.1.5 CheckBox, RadioButton selection event handling 3.1.6 ListView, Spinner item selection event handling 3.2.1 Navigating between Activities using Intent 3.2.2 Passing the information through Intents between Activities 3.3.1 Use of SharedPreferences to store the information 3.4.1 Demonstration of Service in Android Application 3.5.1 Permission manager 3.5.2 Toggle state of Bluetooth and WiFi

Unit– IV Dialog, Menu and Database with RecyclerView and CardView	4.1 Develop menu based android application 4.2 Design the Dialog for user interaction in android application. 4.3 Perform Database operation on local SQLite database. 4.4 Implement RecyclerView and CardView for displaying list of items	4.1.1 Working with Menu in Android Application: ● Options Menu ● Context Menu ● Popup menu 4.2.1 Working with Dialogs 4.2.2 Exploring the Different Types of Dialogs 4.2.3 Custom Dialog design 4.3.1 Databases in Android ● Introducing SQLite ● Cursors and Content Values ● Working with Android Databases ● SQLiteDatabase and SQLiteOpenHelper Class for database operations 4.4.1 Use of RecylerView and CardView
Unit– V Introduction to Android Development using Kotlin	5.1 Develop simple Kotlin program 5.2 Perform basic Event handling 5.3 Publish the application on Play Store	5.1.1 Introduction to Kotlin for Android development 5.1.2 Simple Kotlin program for 'Hello World' 5.2.1 Event handling in Kotlin programming 5.3.1 Building the signed APK 5.3.2 Publishing the application on Play Store

Note: *The UOs need to be formulated at the 'Application Level' and above of Revised Bloom's Taxonomy' to accelerate the attainment of the COs and the competency.*

10.   SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Practical Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basics of Android Development	08				
II	Modelling GUI Using Android	10				
III	Event Handling in Android Application	16	**NOT APPLICABLE**			
IV	Dialog, Menu and Database with RecyclerView and CardView	16				
V	Introduction to Android Development using Kotlin	06				
Total		**56**				

Legends: R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)
Note*: This specification table provides general guidelines to assist students for their learning and to teachers to teach and formulate test items to assess the attainment of the UOs.*

11.   SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

a)   Undertake a Micro-project to design/develop an Android Application for some real problem definition using latest design standards.
b)   Give a seminar on any relevant topics.
c)   Undertake NPTEL online course **Android Mobile Application Development** https://onlinecourses.swayam2.ac.in/nou21_ge41/preview ,
d)   Undertake Coursera online course **Android App Development Specialization** https://www.coursera.org/specializations/android-app-development

12.   SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a)   Massive open online courses (**MOOCs**) may be used to teach various topics/subtopics.
b)   Guide student(s) in undertaking micro-projects.
c)   About **20% of the topics/sub-topics** which are relatively simpler or descriptive in nature are to be given to the students for **self-learning**, but to be assessed using different assessment methods.
d)   With respect to **section No.11**, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
e)   Guide students for using Android Studio for android development and also guide to setup Developer mode option in their Android Devices.

13.   SUGGESTED MICRO-PROJECTS

Only one micro-project shall be planned to be undertaken by a group of students that may be assigned to him/her at the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should preferably be **individually** undertaken to build up the skill and confidence in every student to become a problem solver so that she/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three.**

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based, or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs, and ADOs. Each student will have to maintain a dated work diary consisting of individual contributions to the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

- **Project idea 1 – College Information App:** Design and develop an Application for College information and student-related interaction.
- **Project idea 2 – Admission Procedure information App:** Design and develop an Application for the State level Admission Committee Procedure information application.
- **Project idea 3 – E-commerce:** Design and develop an E-commerce Application.

14.   SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Beginning Android™ Application development	Wei-Meng Lee	Wiley Publishing, Inc.
2	Android Programming with Kotlin for Beginners	John Horton	Packt Publishing Ltd.
3	Headfirst Android Development: A Brain-Friendly Guide 1st Edition	Dawn Griffiths	O'Reilly Media, Inc.
4	Professional Android Application Development	Reto Meier, Ian Lake	Wrox Publication

15.   SOFTWARE/LEARNING WEBSITES

a. https://www.geeksforgeeks.org/introduction-to-android-development/
b. https://www.tutorialspoint.com/android/index.htm
c. Android Mobile Application Development Course on https://nptel.ac.in/ and https://onlinecourses.swayam2.ac.in/
d. Android App Development Courses on https://www.coursera.org/
e. Android Basics in Kotlin https://developer.android.com/courses/

16.   PO-COMPETENCY-CO MAPPING

Semester II	Mobile Application Development (Course Code: 4350704)						
	POs and PSOs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ development of solutions	PO 4 Engineering Tools, Experimentation &Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
Competency Develop an Android Application to solve real-world problems.							
Develop Android applications using Android application Components and Life Cycle of Activity after setting up Android Development Environment.	3	1	2	3	-	-	3
Design Activity using Layouts and Widgets.	3	2	3	2	-	2	3
Apply Event Handling in Android application to perform user actions.	3	3	3	3	-	3	3
Develop Android Applications using Menu, Dialog, and Databases	3	3	3	2	-	2	3

Develop Android applications using Kotlin Language.	3	2	3	2	-	2	3

Legend: '**3**' for high, '**2**' for medium, '**1**' for low or '**-**' for the relevant correlation of each competency, CO, with PO/ PSO

17. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons:

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