GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Course Title: Mobile Application Development
(Course Code: 4351604)

Diploma programme in which this course is offered	Semester in which offered
Information Technology	5th Semester

1.   RATIONALE

Mobile applications have become an essential component of businesses across industries in today's technology-driven world. Mobile Applications provide enormous opportunities for businesses to reach and engage with their customers. As a result, there is a growing demand for skilled Mobile application developers capable of developing innovative and robust applications that meet the needs of both businesses and end users. This demand paves the way for the development of a dedicated course on Mobile application development that focuses on industrial applications and meets market demand. This course develops necessary skills in students, after learning this course; students will be able to develop user-friendly mobile applications.

2.   COMPETENCY

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

*   **Develop user-friendly Mobile applications, design intuitive user interfaces, understand and implement various app components, effectively debug and troubleshoot issues, adapt to emerging technologies and continuously enhance their skills to meet the demands of the industry.**

3.   COURSE OUTCOMES (COs)

The student will develop underpinning knowledge and adequate skills of competency for developing various mobile applications after attaining the following course outcomes.

a) Understand the fundamentals of Android app development.
b) Design Android user interfaces using various layouts, views, and widgets.
c) Connect an Android app to SQLite, Firebase, and MySQL databases.
d) Understand the working of APIs in Android app development.
e) Develop basic mobile applications using the Flutter framework.
f) Understand the steps involved in publishing an Android app to the Google Play Store.

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	
0	0	4	2	0	0	25	25	50

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.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Install Android Studio, set up the Android development environment, and create a simple "Hello World" app.	I	02
2	Develop a simple app that demonstrates the activity lifecycle.	I	02
3	Develop a simple calculator app that takes user input and performs basic arithmetic operations like addition, subtraction, multiplication, and division.	I	02
4	Develop an Android application that uses LinearLayout to arrange UI components vertically or horizontally.	II	02
5	Develop an Android application that uses RelativeLayout to arrange UI components relative to each other.	II	02
6	Develop an Android application that uses ScrollView to display a long list of items.	II	02
7	Develop an Android application that uses ListView and Custom Adapter to display a list of images with text.	II	02
8	Develop an Android application that uses the Navigation Drawer to display a side menu.	II	02
9	Develop an Android application that uses the bottom navigation bar to switch between different tabs.	II	02
10	Develop an Android application that uses an Intent to pass	III	02

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	data between different activities.		
11	Develop an Android application that uses Services to perform background tasks.	III	02
12	Develop an Android application that uses Broadcast Receivers to receive and handle system-level broadcasts.	III	02
13	Develop an Android application that uses Content Providers to share data between different apps and components.	III	02
14	Develop an Android application that uses Content Providers to read system-level data, such as contacts and calendar events.	III	02
15	Create an application that creates a database using SQLiteOpenHelper Class and performs Insert and Read from the SQLite database.	IV	02
16	Create an application to Update and Delete data from the SQLite database using SQLiteOpenHelper class.	IV	02
17	Perform Firebase Integration to your Android application and store the data in the Firebase Database.	IV	02
18	Create an application to retrieve data from the Firebase Database and display it in the RecyclerView.	IV	02
19	Connect an Android application to the MySQL database using PHP, and insert the data in the database table.	IV	02
20	Perform insertion of data to MySQL database using PHP from an Android application.	IV	02
21	Perform reading of the data from the MySQL database using PHP in the JSON format and display on the screen of an Android application.	IV	02
22	Integrate Google maps API to your Android application and display your current location in the app.	V	02
23	Integrate Google maps API to your Android application and find the distance of any nearby location from your current location and display it.	V	02
24	Develop an application which performs Login using the	V	02

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	Google account of the user.		
25	Install Flutter SDK, configure the development environment and display "Hello World" in the centre of the screen.	VI	02
26	Develop a Flutter app to get two numbers from the user and display addition on the screen after clicking a button.	VI	02
27	Develop a Flutter app for Login using static data. If the User ID and Password are correct then clicking a login button should open a new screen showing Username at the center of the new screen.	VI	02
28	Demonstrate publishing an Android app on the Google Play Store following the policies and guidelines.	VII	02

Note

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

ii. **Faculty can suggest students to develop a complete mobile application performing the practicals as listed above. Functionalities can be selected such that after completing the app, all the PrOs listed above can be achieved.**

iii. 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	User Interface Design.	20
2	Coding methodology.	30
3	Testing and debugging of the program.	20
4	Correctness of the program.	20
5	Submission within the time limit.	10
Total		**100**

6.   MAJOR EQUIPMENT/ INSTRUMENTS/SOFTWARE REQUIRED

This major equipment/instrument/software with broad specifications for the PrOs is a guide to procure them by the administrators. This will ensure the conduction of practicals in all institutions across the state in the proper way so that the desired skills are developed in students.

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Computer system with minimum 8 GB RAM, intel core-i5 processor and 128 GB SSD(recommended).	All
2	Android Studio, Xampp Server.	

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 a leader/ team member.
   b) Follow ethical practices.

The ADOs are best developed through the laboratory/field-based 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.

8.   UNDERPINNING THEORY

Only the major underpinning theory is formulated as higher-level UOs of *revised Bloom's taxonomy* in the development of the COs, and competency is not missedby 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 **Introduction to Android App Development**	1a. Explain Android OS, its architecture and versions. 1b. Understand Android SDK and development environment 1c. Explain Activity Life cycle. 1d. Explain event-driven programming	1.1 Introduction to Android 1.2 Android OS features 1.3 Versions of an Android OS 1.4 Android SDK 1.5 Android Virtual Device 1.6 Activity in Android 1.7 Activity Life Cycle 1.8 Event-driven programming in Android

Unit – II Building User Interfaces	2a. Designing UIs using XML layout files 2b. Explain Layout types and view groups 2c. Explain Views and widgets. 2d. Create menus, Navigation Drawer and Bottom Navigation Bar 2e. Display the data in the ListView and RecyclerView using Adapter	2.1 Designing UI 2.2 XML for Designing, Padding, Margin 2.3 Layouts - ViewGroup in Android 2.4 Views and Widgets – Button, TextView, EditText, ImageView, ScrollView 2.5 Menus in Android, Navigation Drawer, Bottom Navigation Bar 2.6 Adapter, ListView, RecyclerView
Unit-III Android App Components	3a. Explain Intents, Services, Broadcast Receivers, and Content Providers 3b. Understand background tasks and Threads.	3.1 Intent in Android 3.2 Services, Broadcast receivers 3.3 Content providers in Android 3.4 Toast in Android 3.5 Threads and background tasks in Android
Unit-IV Database Connectivity	4a. Develop application using SQLite databases 4b. Use Firebase for database operations. 4c. Explain how to connect an Android app to MySQL databases via PHP and JSON.	4.1 SQLite Database 4.2 SQLiteOpenHelper Class 4.3 Create, open and close the database using SQLiteOpenHelper 4.4 Insert, Read, Update and delete the data from the table using SQLiteOpenHelper.
		4.5 Integration of Firebase to application. 4.6 Insert, Read, Update and Delete data to the Firebase database. 4.7 Database operations using PHP in MySQL from an Android application.
Unit-V Working with APIs	5a. Explain working with the APIs and parsing the JSON data into Android applications. 5b. Demonstrate working with Google Maps API to display maps and locations. 5c. Perform integration with Google Sign-In to authenticate users.	5.1 API - Application Programming Interface 5.2 Working with APIs 5.3 JSON Parsing in Android 5.4 Google Maps 5.5 Map Activity 5.6 Configure Google API console 5.7 Google Maps API for locations 5.8 User Authentication using Google Account

Unit-VI **Introduction to Flutter**	6a.Explain the Flutter framework and its advantages. 6b. Develop a basic Flutter app.	6.1 Introduction to Flutter 6.2 Flutter SDK 6.3 Advantages and Disadvantages of Flutter 6.4 Flutter application development configuration 6.5 Basic UI components like Text, TextField, Buttons in Flutter 6.6 Navigation and Routing in Flutter
Unit-VII **Publishing App on Google Play**	7a. Prepare an app to release and generate a signed APK. 7b. Describe the Google Play Store guidelines and policies. 7c. Explain the procedure to upload and publish an app on Google Play.	7.1 Overview of Publish an app 7.2 Prepare for release 7.3 Version your app 7.4 Sign your app 7.5 Google Play store guidelines and Policies 7.6 Test your app 7.7 Upload your app

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.*

9.   SUGGESTED STUDENT ACTIVITIES

Other than laboratory learning, the 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 the following activities in groups and prepare reports of about 5 pages for each activity, also collect/record physical evidence for their (student's) portfolio which will be useful for their placement interviews:

a) Prepare a report based on practicals performed in the laboratory.
b) Undertake micro-projects in teams.
c) Give a seminar on any relevant topics.

10.   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) For Practicals, Faculty can suggest students to develop a complete mobile application performing all the practicals listed in Section 5.

e) With respect to **section No.9**, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.

f) Guide students on how to address issues of society, environment and sustainability using the knowledge of this course.

g) More focus should be given on practical work which will be carried out in laboratory sessions. If possible, some theory sessions may be conducted in labs so that theory and practical can go hand in hand.

h) Arrange a Mobile application development/UI development competition by making groups of a maximum of three students each and award the winning group.

11.   SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in 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 s/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 Four.**

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 in 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 faculty:

Case Study 1: Develop a Mobile Application to manage and store students' data with the following functionalities:
1. Registration
2. Login
3. Search details by student enrollment no
4. Update and delete the data

Case Study 2: Develop a Mobile Application to buy and sell products with the following functionality:
1. Registration and Login
2. Add Product by Seller
3. View Orders by Seller
4. View Products by Buyer
5. Order Products by Buyer

12.   SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Head First Android Development	Dawn Griffiths, David Griffiths	,.Inc ,Reilly Media'O ISBN: 9781492076476
2	Android Programming for Beginners	John Horton	Ingram short title ISBN-10:1789538505
3	Flutter and Dart Cookbook	Richard Rose	Shroff/O'Reilly,Navi Mumbai ISBN: 9789355422446

13.   SOFTWARE/LEARNING WEBSITES

- ▪ Android Development Kit: https://developer.android.com
- ▪ https://flutter.dev/
- ▪ https://developers.google.com/apis-explorer
- ▪ https://onlinecourses.swayam2.ac.in/nou21_ge41/preview
- ▪ https://www.javatpoint.com/android-tutorial
- ▪ https://www.tutorialspoint.com/android/index.htm
- ▪ https://www.geeksforgeeks.org/android-tutorial/
- ▪ https://play.google.com/console/about/

14.   PO-COMPETENCY-CO MAPPING

Semester V	Mobile Application Development (Course Code:4351604)						
	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 And Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning
Competency Develop user-friendly Mobile applications, design intuitive user interfaces, understand and implement various app components, effectively debug and troubleshoot issues, adapt to emerging technologies and continuously enhance their skills to meet the demands of the industry.							
Course Outcomes a) Understand the fundamentals of Android app development.	2	-	-	1	2	-	1
b) Design Android user interfaces using various layouts, views, and widgets.	2	2	3	2	-	-	-

c) Connect an Android app to SQLite, Firebase, and MySQL databases.	2	2	3	2	-	-	2
d) Understand the working of APIs in Android app development.	2	-	3	2	-	-	2
e) Develop basic mobile applications using the Flutter framework.	2	2	2	2	-	-	-
f) Understand the steps involved in publishing an Android app to the Google Play Store.	-	-	-	1	2	-	2

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

15.   COURSE CURRICULUM DEVELOPMENT COMMITTEE
GTU Resource Persons

S. No.	Name and Designation	Institute	Email
1	Roshan R. Rohit Lecturer in I.T.	Govt. Polytechnic for Girls, Surat.	roshanrohit2989@gmail.com
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