

**MCA (4<sup>th</sup> semester)****Lesson Plan Policy****040010425 – Mobile Application Development****Course Credits: 04**

**Course Objectives:** To design UI-rich mobile application using advanced GUI components, animation, gesture and produce robust solution using background services, backend, real time database, web service and share data to different platforms.

**Course Outcomes: Upon completion of the course, students shall be able to**

- CO1: Use the different mobile application development platform and core components to build mobile applications.
- CO2: Explore and demonstrate UI layout and controls for designing an application.
- CO3: Expand user experience with advanced GUI controls like tabs, list, recycler view and map.
- CO4: Connect and manage internal data storage, user preference and shared data with mobile application.
- CO5: Create background services and user alerts for improving performance of an application.
- CO6: Design and compile web services and communication channel for exchanging data with server and other platforms.

**Course Objective and Course Outcomes Mapping:**

To design UI-rich mobile application using advanced GUI component: CO1, CO2, and CO3

To produce robust solution using services, database, web services and sharing data to different platforms: CO4, CO5, and CO6

**Programme Outcomes: The student will have**

- P01: Proficiency in and ability to identify problems related to computer science as well as design and apply computational knowledge to solve them.
- P02: Ability to design, develop, test and maintain system, component, product or process as per needs and specification.
- P03: Understanding of professional and ethical role and responsibility.
- P04: Recognition of the need for and an ability towards life-long learning
- P05: Knowledge of programming languages, database systems, operating systems, software engineering, Web & Mobile technology and relevant modern issues.
- P06: Ability to demonstrate the use of modern tools, models and languages to solve problems related to software development
- P07: An ability to communicate and present knowledge effectively.

**Semester Objectives:**

- Improve presentation skill

- Promote contribution of students to share course related information.
- Develop system based problem solving skill

#### Course Unit Mapping with Course Outcome and Programme Outcome:

Unit No.	Unit Name	Course Outcome						Programme Outcome						
		C01	C02	C03	C04	C05	C06	P01	P02	P03	P04	P05	P06	P07
1	Introduction of Mobile Application development	✓	✓	✓	✓	✓		✓			✓		✓	
2	Resource and Design Essentials			✓	✓			✓	✓	✓	✓	✓	✓	
3	Advanced UI Design			✓	✓				✓	✓	✓	✓	✓	
4	Working with Data Storage					✓		✓	✓		✓	✓	✓	✓
5	Developing Services and Notification						✓	✓		✓		✓		
6	Working with Web Services and File Sharing							✓	✓		✓		✓	✓

Lesson No:	0	Lesson Title:	Introductory Session
Time :	1 Hr.		
Teaching Content:	0.1	Subject Introduction and its need	
	0.2	Post and pre linkage of subject with other subject	
	0.3	Discuss about emerging technology impact on mobile applications as well as job opportunity	
Teaching Methodology	Discussion and questions to be asked based on student knowledge.		

<b>Lesson No:</b>	1	<b>Lesson Title:</b>	Introduction to Mobile Application development
<b>Time:</b>	7 Hrs.		
<b>Learning Outcome:</b>	Student must able to use the different mobile application development platform and core components to build mobile application.		
<b>Assessment:</b>	Quiz, Unit Test – 1 (Th, Pr), Unit Test – 2(Th, Pr) and Internal		

<b>Bridge-In activity by Teacher :</b>	Question – answer session regarding available mobile application in different platform and their flow and features. Need and requirement changes in mobile application development.				
<b>Sub Points</b>	<b>Teaching Content</b>	<b>Teaching &amp; Learning activity Hours</b>	<b>Lesson reference</b>	<b>Teaching Approach</b>	<b>Learning Activity</b>
1.1.	Overview of Mobile technologies : Android , iOS and windows	0.5		Group Discussion.	<b>For All:</b> Supplementary reading and discussion on features of different mobile application development platform.
1.2.	Platform Features, Architecture, Versions and Development tools	1	WM#1, Page No:2-35	Topic Slide and documentation	<b>For Slow learner:</b> Students must write answer of two or three question(s) given by teachers a home work after completion of Unit.
1.3.	Activity: Introduction, lifecycle and linkage with Intents, Calling Activity for Results	1.5	WM#2, Page No:36-97	Topic Slide	
1.4.	Fragment : Introduction, Need, Lifecycle, Creation and Communication between fragment	3		Topic Slide and Demonstration for fragment creation and working.	
1.5.	Gestures : Introduction, Types and Detection technique	1	WR1	Topic Slide	<b>For Active learner:</b> Demonstrate three fragment communication using kotlin.
<b>Reading references:</b>	<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India Pvt Ltd.[WM]</li> <li>2. Reto Meier, professional Android 4 Application Development, Wiley[RM]</li> </ol> <b>Additional Web/Books Reference: [WR= Web Reference]</b> <ol style="list-style-type: none"> <li>1. <a href="https://developer.android.com/training/gestures/detector">https://developer.android.com/training/gestures/detector</a> [WR1]</li> <li>2. Dave MacLean, Pro Android 5, Apress.[DM]</li> <li>3. Erik Hellman, Android Programming, Willey India Pvt Ltd.[EH]</li> </ol>				

Lesson No:	2	Lesson Title:	Resource and Design Essentials		
Time:	10 Hrs.				
Learning Outcome:	Student must able to explore and demonstrate UI layout, controls for designing an application.				
Assessment:	Quiz, Unit Test – 1 (Th, Pr), Unit Test – 2(Th, Pr) and Internal				
Bridge-In activity by Teacher :	Importance of GUI including its variety at desktop, web and mobile platform will be discussed though same application but in different platform.				
Sub Points	Teaching Content	Teaching & Learning activity Hours	Lesson reference	Teaching Approach	Learning Activity
2.1.	Overview of UI : Comparative study between Desktop, Web and Mobile	1	-	Class Discussion	
2.2.	Application Resources and Assets : Storage and Access	1	RM#3,Page No:64-81	Demonstration	
2.3.	Designing UI with Layouts : Linear , Relative , Constraint, List and Grid based	2	WM#3,Page No: 105-123	Hands On and Discussion	<b>For Slow Learner:</b> Discuss comparative analysis of any four layout.
2.4.	UI Screen Elements : Input controls, Navigational component, Informational components	2	WM#4,Page No: 160-179,191-202 WM#5,Page No:,243-249	Demonstration	
2.5.	Customizing style and theme <ul style="list-style-type: none"><li>- Customizing the default theme</li><li>- Add version-specific style</li><li>- Customize widget style</li></ul>	1	RM#3,Page No:68-76 WM#2, Page No:41 WR1	Topic Slide and Hands on	<b>For Active Learner:</b> Creation of user define widget with and place on home screen.
2.6.	Exploring Menu and Dialog	1	WM#5,Page No: 234-242 , WR2	Topic Slide	

2.7.	Animation : Need, Types : Basic , Touch Feedback, Circular Revel , Transition and Property	2	WR3	Demonstration.	<b>For All:</b> Design an application which having form designed using animation, menu and dialog boxes.
<b>Reading references:</b>	<b>Text Books:</b> <ol style="list-style-type: none"> <li>Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India Pvt Ltd.[WM]</li> <li>Reto Meier, professional Android 4 Application Development, Wiley[RM]</li> </ol> <b>Additional Web/Books Reference: [WR= Web Reference]</b> <ol style="list-style-type: none"> <li><a href="https://developer.android.com/guide/topics/ui/look-and-feel/themes">https://developer.android.com/guide/topics/ui/look-and-feel/themes</a> [WR1]</li> <li><a href="https://material.io/components/menus/">https://material.io/components/menus/</a> [WR2]</li> <li><a href="https://developer.android.com/training/animation">https://developer.android.com/training/animation</a> [WR3]</li> <li>Dave MacLean, Pro Android 5, Apress.[DM]</li> <li>Erik Hellman, Android Programming, Willey India Pvt Ltd.[EH]</li> </ol>				

Lesson No:	3	Lesson Title:	Advanced UI Design		
Time:	07 Hrs.				
Learning Outcome:	Student must able to integrate advanced UI controls in development.				
Assessment:	Unit Test – 1 (Th, Pr), Unit Test – 2(Th, Pr) and Internal				
Bridge-In activity by Teacher :	How the look and feel of each controls differs and their properties & callbacks will be discussed. Role of event listeners to make GUI controls active will be demonstrated.				
Sub Points	Teaching Content	Teaching & Learning Activity Hours	Lesson reference	Teaching Approach	Learning Activity
3.1	Working with Tabs, SeekBar , Action Bar and Rating Bar	2	DM #6,Page No: 152-156 WR1, WR2	Topic Slide	For All: Use the action bar for any developed application.
3.2	Displaying Data using custom ListView , GridView and Recycler view	2	WR3	Self-Study and Hands on for Recycler view.	

3.3	Navigation : Components, Customization, Handling click event	1	WR4	Topic Slide	
3.4	Data Visualization : Principals , Types , Selection of Charts	1	WR5,WR6	Discussion and Demonstration	<b>For Active Learner:</b> Enlist and present two application which having advanced GUI controls, charts and maps.
3.5	Location based services : Google Map V2 Integration, Location Tracking, Markers on Maps -Set up Google Play Services -App permission Creation of location service client	1	EH#13, Page No:250-258  WR7	Audio- Video	<b>For All:</b> Application need to be develop for Geocoding and Reverse Geocoding.
<b>Reading references:</b>	<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India Pvt Ltd.[WM]</li> <li>2. Reto Meier,professional Android 4 Application Development,Wiley[RM]</li> </ol> <b>Additional Web/Books Reference: [WR= Web Reference]</b> <ol style="list-style-type: none"> <li>1. <a href="https://developer.android.com/reference/android/support/design/widget/TabLayout.html">https://developer.android.com/reference/android/support/design/widget/TabLayout.html</a> [WR1]</li> <li>2. <a href="https://developer.android.com/training/appbar/index.html">https://developer.android.com/training/appbar/index.html</a>[WR2]</li> <li>3. <a href="https://www.vogella.com/tutorials/AndroidRecyclerView/article.html">https://www.vogella.com/tutorials/AndroidRecyclerView/article.html</a> [WR3]</li> <li>4. <a href="https://developer.android.com/training/implementing-navigation/nav-drawer.html">https://developer.android.com/training/implementing-navigation/nav-drawer.html</a> [WR4]</li> <li>5. <a href="https://material.io/design/communication/data-visualization.html#">https://material.io/design/communication/data-visualization.html#</a> [WR5]</li> <li>6. <a href="http://androidplot.com/docs/quickstart/">http://androidplot.com/docs/quickstart/</a> [WR6]</li> <li>7. <a href="https://developer.android.com/training/location">https://developer.android.com/training/location</a> [WR7]</li> <li>8. Dave MacLean, Pro Android 5, Apress.[DM]</li> <li>9. Erik Hellman, Android Programming, Willey India Pvt Ltd.[EH]</li> </ol>				

<b>Lesson No:</b>	4	<b>Lesson Title:</b>	Working with Data Storage
<b>Time:</b>	07 Hrs.		
<b>Learning Outcome:</b>	Student must able to connect and manage data storage with mobile application.		
<b>Assessment:</b>	Unit Test – 2(Th, Pr) and Internal		
<b>Bridge-In</b>	Question – Answer session on available application of play store which using structured data base or real time, cloud based database		

<b>activity by Teacher :</b>	for various purpose. Like: https://www.thefabulous.co/ , https://www.skyscanner.co.in/ etc				
<b>Sub Points</b>	<b>Teaching Content</b>	<b>Teaching &amp; Learning activity hours</b>	<b>Lesson reference</b>	<b>Teaching Approach</b>	<b>Learning Activity</b>
4.1.	Shared data reading and updation : Call Log , Contact and Media	1	WM#7,Page No: 293-319	Topic Slide	
4.2.	Internal Data Storage, User Options and UI Settings <ul style="list-style-type: none"> <li>- Persisting data to Internal and External files</li> <li>- Saving and loading data from preference file</li> <li>- Use of UI setting screen</li> </ul>	2	WM#6,Page No: 251-273	Topic Slide and Demonstration by students on Setting Screen Design and preference value storing and retrieval.	<b>For All:</b> Develop application which will use UI setting screen to store and retrieve user preference data.
4.3.	CRUD Operations on data <ul style="list-style-type: none"> <li>- Creation and usage of Database</li> <li>- Helper class Creation</li> <li>- CRUD operation</li> </ul>	2	WM#6,Page No: 273-290	Topic Slide and Demonstration.	<b>For All:</b> Implement CRUD operations with help of Room persistence library.
4.4	Managing Cloud based data : Introduction , Integration, Writing and reading data	2	WR2	Demonstration and Hands On	
<b>Reading references:</b>	<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India Pvt Ltd.[WM]</li> <li>2. Reto Meier,professional Android 4 Application Development,Wiley[RM]</li> </ol> <b>Additional Web/Books Reference: [WR= Web Reference]</b> <ol style="list-style-type: none"> <li>1. Dave MacLean, Pro Android 5, Apress.[DM]</li> <li>2. Erik Hellman, Android Programming, Willey India Pvt Ltd.[EH]</li> <li>3. <a href="https://firebase.google.com/docs/storage/android/start">https://firebase.google.com/docs/storage/android/start</a> [WR1]</li> </ol>				

4. <https://cloud.google.com/solutions/mobile/mobile-firebase-app-engine-flexible> [WR2]

Lesson No:	5	Lesson Title:	Developing Services and Notification		
Time:	07 Hrs.				
Learning Outcome:	Student must able to utilize the background threads for mobile application development.				
Assessment:	Unit Test – 2(Th, Pr) and Internal				
Bridge-In activity by Teacher:	Discussion on uses and role of services in mobile application to enhance the performance of the application.				
Sub Points	Teaching Content	Teaching & Learning Activity Hours	Lesson reference	Teaching Approach	Learning Activity
5.1.	Service : Introduction, Life Cycle -Types of Services -Difference between services and threads	1	RM#9 Page No:332-336 WM#11,Page No: 429- 433 WR1	Group Discussion	
5.2.	Service Task Management : Long, Repeated, Asynchronous	3	RM#9 Page No:336-351 DM #15, PageNo:317- 323	Topic Slide and Demonstration	<b>For All</b> :Implementation Services, thread and AsyncTask and find out which method is best for fast response
5.3.	User Alerts : Needs , Types : Alarm and SMS	2	WM#8, Page No: 321-324 WR2	Self-Study	
5.4	Notification : Introduction, Need, Creation and Actions	1	WM#2, Page No: 98-103 WR3	Hands on	



<b>Reading references:</b>	<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India Pvt Ltd.[WM]</li> <li>2. Reto Meier, professional Android 4 Application Development, Wiley[RM]</li> </ol> <b>Additional Web/Books Reference: [WR= Web Reference]</b> <ol style="list-style-type: none"> <li>1. Dave MacLean, Pro Android 5, Apress.[DM]</li> <li>2. Erik Hellman, Android Programming, Wiley India Pvt Ltd.[EH]</li> <li>3. <a href="https://developer.android.com/guide/components/services.html">https://developer.android.com/guide/components/services.html</a>[WR1]</li> <li>4. <a href="http://developer.android.com/reference/android/app/AlarmManager.html">http://developer.android.com/reference/android/app/AlarmManager.html</a>[WR2]</li> <li>5. <a href="http://developer.android.com/reference/android/app/NotificationManager.html">http://developer.android.com/reference/android/app/NotificationManager.html</a>[WR3]</li> </ol>
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Lesson No:	6	Lesson Title:	Working with Web Services and File Sharing			
Time:	10 Hrs.					
Learning Outcome:	Student must able to design and compile web services and communication channel for exchanging data with server and other platforms.					
Assessment:	Unit Test – 2(Th, Pr) and Internal					
Bridge-In activity by Teacher:	Demonstration to develop web services in any platform for parsing it in mobile application.					
Sub Points	Teaching Content	Teaching & Learning activity Hours	Lesson reference	Teaching Approach	Learning Activity	
6.1.	Web Services : Types , Advantages , Architecture, Characteristics	2	DM#14, Page No 265-270	Discussion		
6.2.	JSON : JSON Elements , JSON Parsing through API Consuming Web Services: Using HTTP GET and POST and JSON	2	DM#14, Page No 265-270	Topic Slide and documentation		
6.3.	Wi-Fi Management : Need, Connection, Monitoring active connection	2	RM#16,Page No- 682-684	Topic Slide and Discussion.	For All : Discussion on advantages and disadvantages of Bluetooth and Wi-Fi direct.	

6.4.	P2P connection using Wi-Fi Direct : Overview , Discover and request Peers	2	WR1	Demonstration	<b>For All:</b> Development of application like Xender to transfer single file from one device to other device using Wifi direct.
6.5.	Overview of Socket Programming : Introduction, Connection establish , Channel creation for sharing data	2	WM#10,Page No 417- 426	Class Discussion and Demonstration by students.	
<b>Learning activity:</b>					
<b>Reading references:</b>	<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India Pvt Ltd.[WM]</li> <li>2. Reto Meier,professional Android 4 Application Development,Wiley[RM]</li> </ol> <b>Additional Web/Books Reference: [WR= Web Reference]</b> <ol style="list-style-type: none"> <li>1. Dave MacLean, Pro Android 5, Apress.[DM]</li> <li>2. Erik Hellman, Android Programming, Willey India Pvt Ltd.[EH]</li> <li>3. <a href="https://developer.android.com/training/connect-devices-wirelessly/wifi-direct">https://developer.android.com/training/connect-devices-wirelessly/wifi-direct</a> [WR1]</li> </ol>				

#### Computing Environment:

A student must have the following computing environment in laboratory and/or on his/her laptop.

- Android SDK 1.5.1
- Android Studio Version 1.5.1 or above
- Students have to implement one Practical from each unit using Kotlin Language and rest of practical using Java Language.

#### Concept linkage:

Unit/Sub-Unit	Prior concept linkage	Contemporary Linkage	Post concept linkage
1.4,1.5 Activity, Fragment	030010314 - CC7 Advanced Object Oriented Programming		

6.1,6.2 WebServices		040010424 : Advanced Web Programming Paradigm	
1.5,3.5			040010513 : Advanced Mobile Application Development

Number of Practical Problems: 16

Unit No.	Required no. of problems to get the journal certified	Covering Unit / Sub-Unit	Time required to implement and debug the questions (in hours)	Minimum required for journal Certification
<b>1</b>	3	1.4,1.5	8	3
<b>2</b>	4	2.2,2.3,2.3,2.4,2.5	12	3
<b>3</b>	3	3.1,3.2,3.3,3.4,3.5	8	3
<b>4</b>	3	4.1,4.2,4.3,4.4	10	3
<b>5</b>	2	5.1,5.2,5.3,5.4	5	2
<b>6</b>	2	6.2,6.3,6.4	5	2
<b>Total</b>	<b>16</b>			<b>15</b>