COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

(Abstract)

Faculty of Technology – DDU Kaushal Kendra – M.Voc in Mobile Phone Application Development – Outcome Based Education Syllabus – Approved – Orders issued.

CONFERENCE SECTION

No. Conf II/2941/1/AC-Technology/2020 Dated, Kochi-22, 22.10.2020

Read : Item No I(f.1.c) of the Minutes of the meeting of the Academic Council held on 08.07.2020

ORDER

The Academic Council at its meeting held on 08.07.2020 along with the recommendations of the Standing Committee resolved to approve vide Item read above, the revised course structure and Outcome Based Education (OBE) syllabus of the M.Voc in Mobile Phone Application Development offered at Deen Dayal Upadhyay Kaushal Kendra under Faculty of Technology with effect from 2020 admission onwards.

Orders are issued accordingly.

Dr. MEERA V
REGISTRAR

To

1. Dr. C K Aanandan, Dean, Faculty of Technology and Professor (Rtd.), Department of Electronics, CUSAT, Kochi - 22
2. Dr. K V Pramod, Chairman, Board of Studies in Computer Applications and Professor, Department of Computer Applications, CUSAT, Kochi - 22
3. The Director, DDU Kaushal Kendra, CUSAT, Kochi - 22
4. The Controller of Examinations/Joint Registrar (Academic)/Assistant Registrar(Academic)
5. Academic A/C/Exam 'D'/'E'/Exam Confidential Sections
6. Day File/Stock File/File Copy.

RPR.5

SYLLABUS

M.Voc

in

Mobile Phone Application Development

(Prepared as per Outcome Based Education Framework to be effective from 2020 admission)

DDU KAUSHAL KENDRA

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

DDU KAUSHAL KENDRA

Vision

"Empowering youth for a Skilled and Sustainable Nation"

Mission

M1. Offer quality education in emerging vocational domains in technology and management

M2. Impart skills education to develop industry-ready, employable professionals.

M3. Promote entrepreneurial orientation and skills among the students

M4. Inculcate innovation mind-set in students to excel in the emerging dynamic, global economy.

M5. Foster social commitment and sustainable business philosophy in students

Program Educational Objectives (PEO): - Mobile Phone Application Development

PEO'S	Description
PEO1	Analyze and Synthesize the underlying structures of Software/Mobile architectures to provide effective solutions for Software/Mobile Applications.
PEO2	Work in single and multi-disciplinary groups to Evaluate, Interpret and manage the requirements necessary for successfully test and deploy the project/application.
PEO3	Develop professional, Communicational and Ethical skills required to cater to the technological, social trends in the industry.
PEO4	Understand and Evaluate the advanced programming constructs and tools to Devise sustainable and robust solutions.
PEO5	Apply mathematical and engineering principles to develop solutions that fulfills ones social responsibility.

Programme Articulation Matrix

	M1	M2	M3	M4	M5
PEO1				**X**	**X**
PEO2	**X**	**X**	**X**		
PEO3		**X**	**X**		**X**
PEO4	**X**	**X**		**X**	
PEO5	**X**			**X**	**X**

Program Outcomes (PO):- Mobile Phone Application Development

At the end of the program the student will be able to:

	Description
PO1	Evaluate and Deploy advanced mobile applications.
PO2	Designing solutions using a multitude of tools.
PO3	Effective communication among peers
PO4	Work efficiently in standalone and inter-disciplinary groups
PO5	Analyze and Differentiate project goals.
PO6	Manage and Deploy projects/applications.
PO7	Devise and Test projects/solutions
PO8	Engage in life-long learning to keep up with the latest trends.

Mapping of POs with PEOs

Programme Outcome	**PEO1**	**PEO2**	**PEO3**	**PEO4**	**PEO5**
Engineering Knowledge	**X**		**X**	**X**	**X**
Problem Analysis	**X**			**X**	
Design / Development of Solution	**X**	**X**		**X**	**X**
Conduct Investigation	**X**		**X**		
Modern Tool Usage				**X**	
Engineer and Society		**X**	**X**		**X**
Environment and Sustainability		**X**		**X**	
Ethics			**X**		**X**
Individual and Team work		**X**	**X**		
Communication		**X**	**X**		
Project Management and Finance		**X**		**X**	**X**
Lifelong Learning	**X**	**X**	**X**	**X**	**X**

FIRST SEMESTER

Sl. No.	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internals	End Semester	
1	KAD 2101	Communication Skills Development (G-T)	3	2	0	50	50	3
2	KAD 2102	Fundamentals of Management (G-T)	3	2	0	50	50	3
3	KAD 2103	Object Oriented Programming with Java and SQL (G-P)	2	2	4	50	50	4
4	KAD 2104	Introduction to Mobile Application Development & Web Technologies (D-T)	3	2	0	50	50	3
5	KAD 2105	Software Engineering & Testing (D-T)	3	2	0	50	50	3
6	KAD 2106	User Interface Design & User Experience (D-P)	2	1	2	50	50	3
7	KAD 2107	Android App Development I (D-P)	2	2	2	50	50	3
8	KAD 2108	Software Lab I (Android I, Java &SQL) (LAB)	0	0	4	50	50	2
		Total				800		24

SECOND SEMESTER

Sl. No.	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internals	End Semester	
1	KAD 2201	Professional Skills Development (Training Programme) (G-T)	3	2	0	50	50	3
2	KAD 2202	Project Management (G-T)	3	2	0	50	50	3
4	KAD 2203	Database And Backend Technologies. (G-P)	2	2	2	50	50	3
5	KAD 2204	Android App Development II (D-P)	2	1	2	50	50	3
6	KAD 2205	Cloud And Advanced Technologies (D-P)	2	2	4	50	50	4
3	KAD 2206	Elective – I (G-T/D-T)*	3	2	0	50	50	3
7	KAD 2207	Elective – II (D-T)	3	2	0	50	50	3
8	KAD 2208	Software Lab II (Android II & Database) (LAB)	0	0	4	50	50	2
9	KAD 2209	Internship I – Android App Development	40 Working days.			50	50	12
		Total				900		36

THIRD SEMESTER

Sl. No.	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internals	End Semester	
1	KAD 2301	Entrepreneurship and New Venture Planning (G-T)	3	2	0	50	50	3
2	KAD 2302	Software Product Design & Agile Process Management. (G-T)	3	2	0	50	50	3
3	KAD 2303	Programming with Swift (D-P)	2	2	2	50	50	3
4	KAD 2304	iOS App Development – I (D-P)	2	2	2	50	50	3
5	KAD 2305	iOS App Development – II (D-P)	2	2	2	50	50	3
6	KAD 2306	Elective – III(G-T/D-T)*	3	2	0	50	50	3
7	KAD 2307	Elective – IV(D-T)	3	2	0	50	50	3
8	KAD 2308	Software Lab III (iOS & Swift) (LAB)	0	0	6	50	50	3
		Total				800		24

FOURTH SEMESTER

Sl. No.	Course No.	Name of the Course	P	Max. Marks	Credits
1	KAD 2401	Main Project (90 working days during Semester IV in an IT firm where students contribute to a live iOS/Android/Cross-platform app development) and Viva voce (Continuous Assessment – 100 marks, Final report – 100 marks & Viva-Voce – 100 marks)		300	24
		Total		**300**	**24**

G-T : General Theory, G-P: General Practical, D-T: Domain Theory, D-P: Domain Practical Oriented.

*****Can be a general interdisciplinary subject.

Total Credits: 108 (Core : 96, Elective: 12)

LIST OF ELECTIVES

1. Wearable Technologies in Android
2. Cross Platform Development Using React Native
3. iOS App Development - Advanced Technologies
4. Watch OS Programming.
5. HomeKit and HealthKit programming
6. Retail App Development Frameworks
7. Programming with Objective-C
8. Programming with Python
9. Data Analytics
10. Kotlin Programming
11. Internet of Things (IoT)
12. Low Code Platform.

SEMESTER I

Sl. No.	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internals	End Semester	
1	KAD 2101	Communication Skills Development (G-T)	3	2	0	50	50	3
2	KAD 2102	Fundamentals of Management (G-T)	3	2	0	50	50	3
3	KAD 2103	Object Oriented Programming with Java and SQL (G-P)	2	2	4	50	50	4
4	KAD 2104	Introduction to Mobile Application Development & Web Technologies (D-T)	3	2	0	50	50	3
5	KAD 2105	Software Engineering & Testing (D-T)	3	2	0	50	50	3
6	KAD 2106	User Interface Design & User Experience (D-P)	2	1	2	50	50	3
7	KAD 2107	Android App Development I (D-P)	2	2	2	50	50	3
8	KAD 2108	Software Lab I (Android I, Java &SQL) (LAB)	0	0	4	50	50	2
		Total				**800**		**24**

KAD 2101 COMMUNICATION SKILLS DEVELOPMENT

Course Code: - KAD 2101	Course Title: - Communication Skills Development (GT)	Credits: - 3

Course Description (CD)

The course aims to equip students to communicate effectively using oral, written and electronic modes of communication. Learning outcomes are displaying competence in oral, written, and visual communication, applying communication theories and responding effectively to cultural communication differences, understanding of opportunities in the field of communication and use of current technology-enabled communication.

Learning Outcomes		Cognitive Level
LO1	Apply business communication theory to solve workplace communication issues	Apply
LO2	Communicate effectively with colleagues in meetings, prepare agenda, minutes, and memos, and write different types of business letters, tenders, and quotations	Create
LO3	Prepare resumes, job application cover letters, and effective PowerPoint presentations	Create
LO4	Demonstrate knowledge in negotiation skills	Apply
LO5	Understand the essentials of e-mail communications	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			3					
LO2			3	3				
LO3								1
LO4					3			
LO5				2				

Module 1

Nature and Definition of Communication, Process of Communication, Types of Communication (Verbal & Non Verbal), Importance of Communication, Different forms of Communication, Managing Language, Use of Online Tools for vocabulary building, Use of software for editing.

Module II

Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers, Effective Speaking, Oral Presentation Importance, Characteristics, Presentation Plan, Power point presentation,

Visual aids, Use of presentation software and tools, Presenting data and charts.

Module III

Principles of Letter Writing, Nature & Function of letters, Principles, Elements of structure, Forms of Layout, Styles of presentation. Business Correspondence: Inviting quotations, Sending quotations, Placing orders, Sales letters, Claim & adjustment letters and social correspondence.

Module IV

Other Business Communication, Memorandum, Essentials of a memorandum, Drafting Inter - office Memo, Notices, Agenda, Minutes, Job application letters, preparing the Resume. Report Writing: Business reports- Types, Characteristics, Importance, Elements of structure, Process of writing reports

Module V

Modern communication media: Communicating through E-mails, Blogs, Online forums, Etiquette in using modern communication tools. Interviews: Objectives, Types, Group Communication: Forms, Body language in group communication, Group Discussions, Meetings, Conferences, Negotiations, Business etiquette.

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3. *Chaturvedi P.D and MukeshChaturvedi,* The Art and Science of Business Communication, *4e, Pearson, 2017, ISBN-13: 978-9332587281*
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KAD 2102 FUNDAMENTALS OF MANAGEMENT

Course Code: - KAD 2102	Course Title: - Fundamentals of Management (GT)	Credits: - 3

Course Description (CD)

The course is designed to impart knowledge in foundational principles and practices of management, and Organizational behavior in the context of contemporary organizations. The course helps in developing an understanding and awareness of the essentials of managing the way organizations behave. It analyzes basic management functions to develop and maintain a competitive advantage in the changing business environment from the perspective of an employer and employee.

Learning Outcomes		Cognitive Level
LO1	Understand the role of managers in organizations, employee motivation, its determinants, and organization structure	Understand
LO2	Analyze individual and group behavior in the organizational context	Analyze
LO3	Evaluate the appropriateness of different leadership styles	Evaluate
LO4	Understand the process and procedures involved in staffing	Understand
LO5	Understand the function of controlling and how planning and controlling are aligned.	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			1	2				
LO2			3	3				
LO3				3	3			
LO4			2		2			2
LO5				3	2			2

Module I

Introduction to Organisational management, nature and complexity - Managerial Skills, Schools of management thought, Organisational environment and culture.

Module II

Introduction to Planning-Planning process- Plans for different management levels- Planning & Decision Making -Types of Decision. Organizing Concept, Process of Organizing, Designing Organizational Structure, Formal and informal organization - Managing Individuals and diverse workforce in organisations.

Module III

Manpower Planning, Job analysis, Recruitment & Selection, Training & Development, Performance management. Leadership: Influence, Leadership Style, Leadership Development. Introduction to Controlling Control process- Types of Control System - How and what to Control.

Module IV

Significance of Organizational Behaviour. Personality - Concept, Determinants and Theories. Perception Process, Managerial Implications of Perception. Learning - Concept, Theories. Motivation Concept and Its relevance for Individual and Organization. - Theories.

Module V

Managing Teams- Kinds, characteristics and enhancing work team effectiveness. Group Dynamics, Stress and Behaviour - Sources of Managerial Stress – managing stress. Conflicts in organisation and management

REFERENCES

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2. *Koontz H., and Weihrich H.,* Essential of management: An international perspective, *New Delhi: Tata McGraw-Hill publishing Co. Ltd, 2008, ISBN-13: 9780071067676.*
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KAD 2103 Object Oriented Programming with Java and SQL

Course Code: - KAD 2103	Course Title: - Object-Oriented Programming with Java and SQL (GP)	Credits: - 4

Course Description (CD)

The course equips the students to understand the fundamentals and advanced concepts in Object-Oriented Programming. It also introduces the concepts of database programming using SQL. It enables the students to design applications using the JAVA framework utilizing data-structures, class, inheritance, threading, methods, objects and error handling. JAVA FX is introduced to enhance UI developments. It also enables students to design databases using DDL, DML and DCL statements.

Learning Outcomes		Cognitive Level
LO1	Understand the basics of programming to write simple programs in java and understand the syntax and semantics of database programming using SQL.	Understand
LO2	Apply the programming structures to write simple/intermediate programs and debug it using exception handling.	Apply
LO3	Design and create intermediate/complex solutions using advanced java concepts	Create
LO4	Explain the basics of UI programming; design and create UI programs using the JavaFX framework.	Create
LO5	Analyze and create database programming aspects to design and manage robust databases and synthesize efficient queries.	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1						**1**		
LO2	**1**						**2**	
LO3	**2**	**1**				**2**		
LO4	**1**					**1**		
LO5	**1**	**1**				**1**		

Module I

Introduction to object oriented programming, Java Virtual Machine, Java overview, Data Types, Variables, Arrays, Operators, Expressions, Decision Making through

branching and looping. Introduction to classes and Objects: Introduction, declaring class, creating objects, Adding methods to class, Overloading Methods, Using objects as parameter, constructors, parameterized constructor, overloading constructor, Argument passing, returning objects, Recursive methods, Static variables block methods, Controlling access to class members, Nested classes, inner classes, command line Arguments, this keyword, variable length Arguments.

Module II

Introduction, Creating Subclass, calling super class constructor, Referring super class members, Referring subclass objects with super class variables, Multilevel inheritance and its implementation, Overriding Methods and dynamic method dispatch, Abstract methods, Abstract classes, Interfaces, Multiple inheritance, Interface, final keyword, using variables in interfaces, Extending interfaces, finalize() method. Packages: introduction to Packages, importing from other packages, access protection in packages, static import, introduction to wrapper classes, Auto Boxing and Auto unboxing, Character class, Boolean class. Exception handling: Introduction, try and catch blocks, single try and multiple catch blocks, Nested try, throw statement, throws statement finally block, creating our Exceptions, Chained Exceptions.

Module III

Introduction, Thread Creation, Thread priorities, Threads Synchronization, Producer-Consumer problem, Wait and notify Methods, Deadlocks, Suspending and Resuming a Thread. I/O Basics:- Introduction, Concepts of Streams, Stream classes, byte stream classes, character stream classes, using streams, other useful I/O classes, using File classes, Input Output Exceptions, Creation Of files, reading and writing characters, Reading/ Writing Bytes, Handling primitive Data types, concatenating and buffering Files, random access Files, interactive Input Output. GUI Programming using Java FX: Introduction to JavaFX, Hello JavaFX, Event Handling, Scene Layout, Layout Panes, User Input, JavaFX Node Hierarchy, Lists, Tables, Menus.

Module IV

Getting Started with SQL: Relational Database Fundamentals, Database Models, Database Design Considerations. SQL Fundamentals: SQL Statements, Keywords, Datatypes, Nulls, Constraints. The Components of SQL: DDL, DML, DCL. Building and Maintaining a Simple Database Structure: Simple Database, Create, Alter, Deleting. Multitable Relational Database: Design, Indexes, Integrity, Normalization.

Module V

Manipulating Database Data: Add, Select, Update, and Delete data, Zeroing In on the Data You Want: Select, Where, Logical Operators, Group By, Having, Order By. Using Relational Operators: Union, Intersect, Except, Join, On vs. Where, Nested Queries, Recursive Queries. Database Security, Protecting Data: Transaction, Commit & Rollback, Locking Database Object, Backup, Savepoint & Subtransactions, Accessing Data with ODBC and JDBC, Advanced Topics: Cursors, Procedures, Triggers, Exception Handling.

REFERENCES

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KAD 2104 Introduction to MobileApplication Development & Web Technologies

Course Code: - KAD 2104	Course Title: - Introduction to Mobile Application Development & Web Technologies (DT)	Credits: - 3

Course Description (CD)

The goal of this course is to examine the various concepts and architectures related to mobile application development and web technologies. The mobile OS architecture and web architecture are introduced. The students acquire an in-depth understanding of web technologies like HTML, XML, protocols used, protocol architectures, web architectures, JSON, HTML5, Socket programming, and its implementations. The fundamentals of the GraphQL framework is explained.

Learning Outcomes		Cognitive Level
LO1	Understand the basic concepts for mobile platforms and their supporting technology, and classify the different architectures used in server/client/cloud systems.	Understand
LO2	Evaluate the architecture used for web-based development and deployment	Evaluate
LO3	Evaluate the different protocols used for internet communication	Evaluate
LO4	Understand the different frameworks used for robust data transmission in the Client-Server system, the concepts of Socket programming, common attacks, defense mechanisms, and error handling	Understand
LO5	Analyze the syntax and semantics for data transfer endpoints or API's.	Analyze

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1					**1**			
LO2					**1**			
LO3	**1**							
LO4	**2**					**1**		
LO5		**1**						

Module I

Introduction to mobile phone generations – 1G to 5G, Smart phone architecture-ARM and Intel architectures, Power Management, Screen resolution, Touch interfaces, Memory-Sensors, I/O interfaces, GPS, Application deployment. Mobile OS Architectures-Kernel structure-Comparing and Contrasting architectures of Android, iOS and Windows, Darwin vs. Linux vs. Windows, Runtime (Objective-C vs. Dalvik vs. WinRT), Approaches to power management and Security

Module II

Mobile Application Architectures: Client-Server-Connection Types-Synchronization-Architectural Patterns-Architectural Design Tenets. Mobile Infrastructure: Mobile Device Types-Mobile Device Components-Connection Methods. Mobile Client Applications: Thin Client-Fat Client-Web Page Hosting-Best Practices, Issues-Existing Web Architectures and Back-End Systems Security Issues.

Module III

Introduction to Web: In Perspective, Origin. Before the web: TCP/IP. Birth of WWW: HTTP. Web Servers, Web Browsers. HTML & its Roots, XML & Applications, Dynamic Web Applications, Approaches to web application development.

Module IV

Internet Programming: IP: Packet Format, Addressing, Addressing Class, Routing, Protocols -- Network: ARP, ICMP, DHCP, Transport: TCP, UDP. IPv6, Wireless IP, FTP, SNMP, SMTP. Domain: DNS, DDNS, NIS, LDAP. File: FTP, SFTP, TFTP. Mail: SMTP, MIME, POP, IMAP.
WAP, VoIP, IPTV. JSON: Introduction, Datatypes, Objects, Schema, Encode and Decode. JSON with PhP, JSON with Java, JSON with Python.

Module V

GraphQL : Introduction- GraphQL & Relay, GraphQL vs REST. GraphQL Server: Setting Up, Node.js, Schema, MongoDB, HTTP Interface, Editor. The Query Language: Documents & Operations, Fields, Variables, Directives, Aliases, Fragments & Mutations. The GraphQL Schema: Object, Introspection, type System, resolve function, validation & versioning. Web Socket Programming: Introduction: Handshake, Life before WebSocket, HTML5, WebScoket Protocol. WebSocket API: Overview, Events, Actions. Server Configuration: Setting up, Connection, Other Methods. Data Transfer: Sending, Receiving, Decoding. Security: Common Attacks & Defenses, Security Tools, Error Handling.

REFERENCES

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KAD 2105 Software Engineering & Testing

Course Code: - KAD 2105	Course Title: - Software Engineering & Testing (DT)	Credits: - 3

Course Description (CD)

This course is specifically designed to provide an in-depth understanding of software engineering and software testing. The principles and architectures used in software engineering such as product lifecycle, system modeling, design and implementation, requirement engineering, prototyping, MVC, MVP, and MVVM are the core concepts evaluated. Apart from software engineering, testing strategies such as unit, usability, requirement, user, performance testing are analyzed along with the tools required for the testing are also applied.

Learning Outcomes		Cognitive Level
LO1	Understand the ethics in software development, the software architecture relevant to software development, and the types of testing used in different development scenarios.	Understand
LO2	Analyze the basic engineering process models.	Analyze
LO3	Apply tool based testing in web development.	Apply
LO4	Apply tool-based prototyping and project management.	Apply
LO5	Analyze test cases for unit, usability and performance testing	Analyze

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			**1**				**1**	
LO2					**1**			
LO3		**1**					**2**	
LO4			**1**	**1**	**2**			
LO5							**3**	

Module I

Introduction- Professional software development, Software engineering ethics, Case studies, Software Processes- Software process models, Process activities, Requirements Engineering, System Modelling, Design and Implementation, Software

Testing and Evolution.

Module II

Model-View-Controller (MVC) - Introduction, implementation in iOS and Android, Model-View- Presenter (MVP) - Concepts of Model, View and Presenter. Working with a simple mobile app example, Model-View-View-Model (MVVM) – Concepts, implementation in andoid/iOS mobile app development, View-Interactor-Presenter-Entity-Router (VIPER) – What is VIPER?, Work with an iOS example, Compare its implementation in android and iOS.

Module IV

Types of Mobile Testing – Software vs. Hardware, Types of Mobile App Testing – Usability, Compatibility, interface, services, low-level resource, performance, operational, installation & security, Mobile Application Testing Strategy, Testing with Emulators: Device Emulators, Browser Emulators, Operating Systems Emulator. Mobile App testing with Tools: Selenium, Appium, MonkeyRunner, Test Complete, HP ALM, Rational functional tester, JMeter, Load runner.

Module IV

User Testing: Concepts, different types of user testing, User Testing vs. Usability testing, Working with Usability testing tools, Integrate JustinMind prototypes with usability testing tools- Validately, Atlassian JIRA etc.

Module V

Practical Tasks- Selection of a suitable android/iOS app, Prepare Test cases, Script identification and modification, Manual and Automated testing, Usability testing, Performance Testing, Security & Compliance Testing, Device Testing, Maintain the Test case Sheet and generate Test summary Report.

REFERENCES

1. *Ian Sommerville*, Software Engineering (10th Edition), *Pearson Education, 2017, ISBN- 13: 978-9332582699*
2. *Frank Tsui and Orlando Karam,* Essentials of Software Engineering, *Jones & Bartlett Learning LLC, 2016, ISBN-13: 978-1284106008*
3. *Prajyot Mainkar,* Expert Android Programming, *Packt Publishing, 2017, ISBN-13: 978- 1786468956*
4. *Jon Hoffman ,* Swift 4 Protocol-Oriented Programming, *Packt Publishing , 2017, ISBN- 13: 978-1788470032*
5. *Daniel Knott,* Hands-On Mobile App Testing: A Guide for Mobile Testers and Anyone Involved in the Mobile App Business, *Addison Wesley, 2015, ISBN-13: 978-0134191713*
6. *Jeffrey Rubin, Dana Chisnell, Jared Spool,* Handbook of Usability Testing:

How to Plan, Design, and Conduct Effective Tests, *John Wiley & Sons; 2008, ISBN-13: 978- 0470185483*

7. *Jakob Nielsen and Raluca Budiu,* Mobile Usability*, New Riders Press, 2012, ISBN-13: 978-0-321-88448-0*
8. *Web References: https://www.raywenderlich.com/164993/new-course-ios-design-patterns http://appium.io/*

   http://selendroid.io/

   https://smartbear.com/product/testcomplete/mobile-testing/

KAD 2106: User Interface Design & User Experience

Course Code: - KAD 2106	Course Title: - User Interface Design & User Experience DP	Credits: - 3

Course Description (CD)

This course aims to assess the scenarios used for designing UI and UX components in mobile application development. The students evaluate and synthesize the UI design components such as widgets, navigation, intents, language and region, layouts, patterns, anti-patterns, prototyping, UX considerations, map, and location-based design standards.

Learning Outcomes		Cognitive Level
LO1	Evaluate User Interface design components in Android	Evaluate
LO2	Analyze responsive user interface design and design based on locale	Analyze
LO3	Analyze different UI design methodologies	Analyze
LO4	Design and create wireframe based on tools	Create
LO5	Analyze UI patterns, anti-patterns, and the lean principle of UI/UX	Analyze

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1					**1**			
LO2		**1**				**1**	**1**	
LO3				**1**				
LO4	**2**	**1**						
LO5		**1**		**1**	**2**			

Module I

Usability and user interface design – Design considerations for mobile and touch devices – UI components of Android: Android intents, Android navigation, Widgets, - Android notification methods – Designing for hardware – Designing User interface components: Widgets, Typography, Icons, and Transitions.

Module II

Managing Android resources: Designing for Screen, Language and Region, platform versions, device modes – Android App Layouts – Graphics and Responsive Design – Responsive user interface design – case studies

Module III

UI Design Patterns: Benefits, Guidelines - User action design patterns – Navigation and layout patterns – Data design patterns – UI Anti patterns – Android design patters for home screen, Search, Sorting and filtering, data entry, forms, navigation, and tablet patterns

Module IV

Material Design: The basics: material design, views, layouts, resources. The Full Design: prototyping, visuals, design, animation. Mobile Wireframing: Representing inputs, gestures and motion, JustinMind|MockPlus - Lean Principles for UX, UX Considerations.

Module V

Mobile UX patterns: Launcher, Tray, List, Rotate, Login, Camera, Map and Location – Mobile Prototyping: Methods of prototyping, Using Device to prototype, Case studies – Using performance Matrices, Future of UX.

REFERENCES

1. *Greg Nudelman,* Android Design Patterns: Interaction Design Solutions for Developers, *Wiley; 1 Kindle Edition, 2013, ISBN-13: 978-1118394151*
2. *Ian Clifton,* Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps (Usability), *Addison-Wesley Professional; 1 Kindle Edition, 2013, ISBN-13: 978-0321886736*
3. *Adrian Mendoza,* Mobile User Experience: Patterns to Make Sense of it All, *Morgan Kaufmann, 2013, ISBN-13: 978-0124095144*
4. *Jeff Gothelf and Josh Seiden,* Lean UX: Applying Lean Principles to Improve User Experience, *Oreilly; Kindle Edition, 2013, ISBN-13: 978-1449311650*
5. *Austin Govella,* Hacking Product Design: Help Any Team Build a Better Experience, *Apr 25, 2018, ISBN-13: 978-1491975039*
6. *Kevin M. Hoffman and Matt Sutter,* Meeting Design: For Managers, Makers, and Everyone, *Apr 2018, ISBN-13: 978-1933820385*
7. *Ian G. Clifton,* Android™ User Interface Design Implementing Material Design for Developers, *Second Edition, Addison-Wesley Professional, 2016, ISBN-13: 978- 9332570924*

KAD 2107 Android App Development I

Course Code: - KAD 2107	Course Title: - Android App Development I DP	Credits: - 3

Course Description (CD)

This course equips students for developing mobile applications based on the Android framework. The core contents include fundamentals such as the android environment, architectures, and frameworks, it also has an in-depth assessment of android controls, dialogs, threading, styles, life-cycle events, notifications, localization, fragments, views, adapters, intents, services, and broadcasts. The above features are evaluated and employed in projects.

Learning Outcomes		Cognitive Level
LO1	Understand Java and Android development framework components and Java/Android Development Tools	Understand
LO2	Evaluate the core building blocks of android and android lifecycle architecture	Evaluate
LO3	Design and create an android project based on UI components	Create
LO4	Evaluate different messaging constructs and themes in android	Evaluate
LO5	Create projects based on Fragments, Adapters, Services, Intents, Broadcast Receivers, and RecyclerView	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**							
LO2				**1**		**1**		
LO3	**2**				**1**	**2**	**1**	
LO4	**1**	**1**						
LO5	**3**					**3**		

Module I

Introduction of Mobile Technology: History of mobile phones, Evolution of Mobile Technology. Introduction to Java Enabled Mobiles: Micro Edition, J2ME. Introduction to Android: History, Danger, Android Inc, HTC Sooner, T-Mobile G1. Introduction to Software's and Tools: Android Studio. Introduction to Building Tools: Java, JDK, JRE, Android SDK, Android Developer Tools. Setting up Android Environment, Introduction to Android OS: Android Architecture.: Overview of the Stack , Linux

Kernel , Native Libraries , Dalvik Virtual Machine, Android Virtual Machine (ADT), Dalvik Debug Monitor Server (DDMS), LogCat, Application Framework, Application Licensing, Gradle.

Module II

Introduction to Android Development: Android Core Building Blocks, Android Emulator, AndroidManifest.xml, R.java file, uses-permission, Project Structure, Layout resource. Hello World User Interface: Working with Button, Toast, Button, Toggle Button, Switch Button, Image Button, Check Box, Alert Dialog, Spinner, Auto Complete Text View, Rating Bar, Date Picker, Time Picker, Progress Bar. Android Life Cycle: Activity, Intent, Android Menus, Layout Manger.

Module III

Intermediate Development I: Notifications, Toast, Custom Toast, Dialogs, Status bar Notifications. Multithreading: Using Java Muti threading classes, AsyncTask, Handler, Post. Styles and Themes: Creating and applying simple Style, Inheriting built-in Style and User defined style, Using Styles as themes. Resources and Assets: Android Resource, Using resources in XML and code, Localization, Handling Runtime configuration changes.

Module IV

Intermediate Development II: Fragment Lifecycle, Fragment Example, Dynamic Fragment. Adaptor: Array Adaptor, ArrayList Adaptor, Base Adaptor. View: Grid View, Web View, Scroll View, Search View, Tab Host, DynamicListView, ExpandedListView. Creating UI through code and the XML, Communicating data among Activities, Overview of services in Android, Implementing a Service, Service lifecycle, Recycler View.

Module V

Advanced Intent and Broadcast Receivers: Role of filters, Intent-matching rules, Filters in your manifest, Filters in dynamic Broadcast Receivers, Creating Broadcast receiver. Receiving System Broadcast: Understanding Broadcast action, category and data, Registering Broadcast receiver through code and through XML, Sending Broadcast.

REFERENCES

1. *Dawn Griffiths,* Head First Android Development, *O'Reilly Media, Inc, 2015. ISBN- 13:978-1449362188.*
2. *Mark L. Murphy*, The Busy Coder's Guide to Android Development, *Commons Ware, LLC, 2015, ISBN-13:978-0981678009.*
3. *Wallace Jackson,* Android Apps for Absolute Beginners, *Apress, 2012. ISBN-13:978- 1430247883.*
4. *Dawn Griffiths and David Griffiths,* Head First Android Development: A Brain-Friendly Guide, *O'Reilly Media, Aug 19, 2017, ISBN-13: 978-1491974056*

5. *Bill Phillips, Chris Stewart,* Android Programming: The Big Nerd Ranch Guide*, Addison- Wesley Professional, 2015, ISBN-13: 978-0134171456.*

KAD 2108 Software LAB- I (Android I, Java & SQL)

Course Code: - KAD 2108	Course Title: - Software Lab I (Android I, Java &SQL) LAB	Credits: - 2

Course Description (CD)

This course employs the concepts taught in the first semester for developmental purposes. JAVA, SQL, and Android are used for the implementation of real-world scenarios that enable students to understand the principles and functionalities behind each of the programming languages respectively. The students can design solutions by applying the concepts learned so far.

	Learning Outcomes	Cognitive Level
LO1	Create advanced applications based on Java	Create
LO2	Create advanced databases based on SQL and SQLite	Create
LO3	Design and Create advanced projects based on Android	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1		**2**		**1**		**2**	**1**	
LO2		**2**		**1**		**2**	**1**	
LO3		**3**		**1**		**1**	**1**	

The Lab is centered on the concepts covered on the subject Android App Development – I and Object Oriented Programming with Java & SQL in Semester I.

Java Basics: Programs to familiarize with the following concepts.

a. Data Types, Variables, Arrays, Data Structures.
b. Operators, Control Statements and Loops.
c. Class, Inheritance Polymorphism.
d. Packages and Interface.
e. Exception Handling.
f. Threading: Simple and Multithreading.
g. Java Collections: Basic and Advanced.
h. Java IO: File Handling.
i. Java Networking: Sockets.

SQL Basics: Programs to familiarize with the following concepts.

j. DDL and DML Queries.

k. Grouping and Aggregating.
l. SQL Joins.
m. Inner Queries and Multilevel Queries.

SQLite Basics: Programs to familiarize with the following concepts.

n. SQLite Queries: Create, Drop, Alter, Insert, Select, Delete.
o. Query Filters: Group By, Order By.
p. Conditions: Where and Having.
q. Aggregate Functions.

Android Basics: Programs to familiarize with the following concepts.

r. Sample Program: Hello World.
s. Layouts and Positioning.
t. Controls and Widgets.
u. Activity and Intents.
v. Activity Permissions.
w. Notifications.
x. Threading and AsyncTask.
y. Resources.
z. Views.

Note: - The Elective Subjects as Selected by the students will be covered as per requirements.

REFERENCES

1. *Schildt ,* Java 2:The Complete Reference*, Tata McGraw-Hill Education, 2002, ISBN-13 : 9780070495432*
2. *Jay Kreibich,* Using SQLite*, O'Reilly Media Inc., 2010, ISBN-13 9780596521189.*
3. *Wilton,* Beginning SQL*, John Wiley & Sons, 2005, ISBN-13: 9788126505852*
4. *Mark L. Murphy,* The Busy Coder's Guide to Android Development*, Commons Ware, LLC, 2015, ISBN-13:978-0981678009.*
5. *Reto Meier,* Professional Android 4 Application Development*, Wrox, 2012, ISBN-13: 978- 1118102275.*

SEMESTER II

Sl. No.	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internals	End Semester	
1	KAD 2201	Professional Skills Development (Training Programme) (G-T)	3	2	0	50	50	3
2	KAD 2202	Project Management (G-T)	3	2	0	50	50	3
4	KAD 2203	Database And Backend Technologies. (G-P)	2	2	2	50	50	3
5	KAD 2204	Android App Development II (D-P)	2	1	2	50	50	3
6	KAD 2205	Cloud And Advanced Technologies (D-P)	2	2	4	50	50	4
3	KAD 2206	Elective – I (G-T/D-T)*	3	2	0	50	50	3
7	KAD 2207	Elective – II (D-T)	3	2	0	50	50	3
8	KAD 2208	Software Lab II (Android II & Database) (LAB)	0	0	4	50	50	2
9	KAD 2209	Internship I – Android App Development	40 Working days.	50	50	12		12
		Total				**900**		**36**

KAD 2201 PROFESSIONAL SKILLS DEVELOPMENT
(Training Programme)

Course Code: - KAD 2201	Course Title: - Professional Skills Development GT	Credits: - 3

Course Description (CD)

The course is conceived as a training program for students to enhance their productivity and skills in communication, interpersonal effectiveness, leadership, and teamwork.

Learning Outcomes		Cognitive Level
LO1	Understand and apply skills in interpersonal relationships in the workplace	Understand
LO2	Apply productivity improvement techniques at work.	Apply
LO3	Understand and demonstrate knowledge of problem-solving and creativity techniques.	Understand
LO4	Understand demonstrate skills in public speaking, oral presentations, and teamwork.	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			3	2				
LO2			1	1				2
LO3			2					2
LO4			2	3				2

Module I: Personal skills

Developing Self-Awareness, Managing Personal Stress, Goal setting, Personal SWOT analysis, Personal productivity techniques, Solving Problems Analytically and Creatively, Positive thinking.

Module II: Interpersonal skills

Training on Johari Window - Building Relationships by Communicating Supportively, Gaining Power And Influence, Motivating Others- Building Emotional intelligence Managing Conflict.

Module III: Group skills

Empowering and Delegating, Building Effective Teams And Teamwork, Negotiating effectively, Leading Positive Change.

Module IV: Specific communication skills

Extempore and public speaking, Group Discussion, Building Skills for cracking Interviews, Conducting Meetings

Module V: Leadership skills

Games, Understanding power, Task Assignments, Role perception, organizing events, feedback.

KAD 2202: PROJECT MANAGEMENT

Course Code: - KAD 2202	Course Title: - Project Management GT	Credits: - 3

Course Description (CD)

The course introduces project management terms and concepts. Students will discover the project life cycle and learn how to build a successful project from pre-implementation to completion. Project management topics such as resources, costs, time constraints, and project scopes are also discussed in the course.

Learning Outcomes		Cognitive Level
LO1	Understand the concepts of project definition and life cycle	Understand
LO2	Understand demonstrate understanding of project scope, work definition, and work breakdown structure (WBS)	Understand
LO3	Analyze the complex tasks of time estimation and project scheduling, including PERT and CPM.	Analyze
LO4	Understand the use of computers in project management.	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1					3	2	1	
LO2					3	3	1	
LO3					3	3	1	
LO4					2	2		

Module 1

Basics of Project Management: Introduction, Need for Project Management, Project Management Knowledge Areas, The Project Life Cycle, Project Management Processes, The Project Manager (PM), Challenges in project management. Business Case, Project screening and Selection Techniques. Project Planning: Introduction, Need and Process. Structuring concepts and Tools- (WBS, OBS, and LRC).

Module II

Organizational Structure and Organizational Issues: Concept of Organizational Structure, Roles and Responsibilities of Project Manager , Leadership, Conflict Resolution, Team Management and diversity management.

Module III

Project Planning Tools (Bar charts, CPM, and PERT):Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability,

Resources Considerations in Projects: Introduction, Resource Allocation, Scheduling, Project Cost Estimating-Types of Estimates and Estimating Methods. Project Risk Management: Risk Identification, Risk Analysis, Reducing Risks.

Module IV

Project Quality Management: Introduction to Quality, Quality Concepts, Value Engineering. Project Management Information System, Purchasing and Contracting for Projects, Project Performance Measurement.

Module V

Project Execution, Project Control Process, Purpose of Project Execution and Control. Project Cost Control and Time cost Tradeoff. Project Close-out, Termination and Follow-up: Project Close-out, Project Termination, Project Follow-up, Project Management Softwares.

REFERENCES

1. Bentley, The Essence of the Project Management Method, *7th Edition. CAIS Management, 2011, ISBN-13 9780954663568*

2. Charles G. Cobb, Making Sense of Agile Project Management: Balancing Control and Agility, *John Wiley and Sons, 2011, ISBN-13: 978-0-470-94336-6*

3. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling. *11ed, John Wiley and Sons, 2013, ISBN-13: 978-1118022276*

4. *Jack R. Meredith, and Samuel J. Mantel,* Project Management: A Managerial Approach,

6thedition, John Wiley and Sons, 2005, ISBN-13: 978-0471715375

5. Project Management Institute, A Guide to The Project Management Body Of Knowledge (PMBOK Guide), *4th edition, 2008, ISBN-13: 978-1933890517*

6. Kathy Schwalbe, Information Technology Project Management, *5thedition, Course Technology, 2008, ISBN-13: 978-1423901457*

KAD 2203 DATABASE AND BACKEND TECHNOLOGIES

Course Code: - KAD 2203	Course Title: - Database And Backend Technologies GP	Credits: - 3

Course Description (CD)

This course analyzes the different functionalities of DBMS including DDL, DML, and DCL statements. The topics are not limited to but also include creation, deletion, editing of databases. It also includes triggers, aggregate functions, views, joins, and stored-procedures. The MongoDB tool is employed to implement CRUD operations in real-time scenarios. Concepts of BigData and Hadoop architecture is introduced.

Learning Outcomes		Cognitive Level
LO1	Analyze different types of DBMS and Employ it in real-life problems	Analyze
LO2	Evaluate different means of advanced DBMS functions and implement them in the production environment.	Evaluate
LO3	Design and create databases based on MongoDB tool.	Create
LO4	Understand the concepts of BigData and its application.	Understand
LO5	Design and create queries based on triggers, aggregate functions, stored procedures, SQL joins, DDL, DML, and views (Create).	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**				**1**			
LO2		**1**				**1**		
LO3	**2**	**1**						
LO4						**1**		
LO5		**3**						

Module I

Relational vs. Non-relational databases, SQL, Popular SQL databases and RDBMS‟s, document oriented databases, Categories of Non-relational databases, popular non-relational databases, Comparing document-oriented and relational databases using examples, How to choose SQL or No-SQL database to work with a real-life problem.

Module II

SQL Server - Understanding SQL, Introducing SQL Server, Retrieve, sort, and format database contents, filtering techniques, using aggregate functions, join two or more

related tables, Insert, update, and delete data; Create and alter database tables; Work with views, stored procedures, Manage Transaction Processing; Work with XML and JSON; Advanced SQL Features.

Module III

Mongo DB server- Installation, MongoDB Basics, MongoDB CRUD Operations, SQL to MongoDB, MongoDB Indexing, Monitoring & Backup, Create User in MongoDB & assign Roles, Indexing, Aggregation, MongoDB Shared Cluster, Deployment

Module IV

Work with five real world examples, Design SQL or Non-SQL database for each, Implement and deploy it using appropriate server.

Module V

Introduction to Big data systems, Real-time processing of web-scale data, Hadoop-Introduction, HDFS and MapReduce concepts with examples, Streaming-Working with an example.

REFERENCES

1. *Guy Harrison,* Next Generation Databases: NoSQL and Big Data, *1st ed. Edition, Apress, 2015, ISBN-13: 978-1484213308*
2. *Luc Perkins , Eric Redmond, Jim Wilson,* Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, *2nd Edition, Pragmatic Bookshelf, 2018, ISBN-13: 978-1680502534*
3. *Ben Forta,* Microsoft SQL Server T-SQL in 10 Minutes*, Sam's Teach Yourself, Sams publication, 2016, ISBN-13: 978-0672337925*
4. *Dejan Sarka,* SQL Server 2016 Developer's Guide*, Packt Publishing Limited , 2017, ISBN-13: 978-1786465344*
5. *Cyrus Dasadia , Amol Nayak ,* MongoDB Cookbook *, Packt Publishing , 2016, ISBN-13: 978-1785289989*
6. *Nathan Marz, James Warren,* Big Data: Principles and best practices of scalable realtime data systems*, Manning Publications, 2015, ISBN-13: 978-1617290343*
7. *Benjamin Bengfort ,* Data Analytics with Hadoop: An Introduction for Data Scientists*, O'Reilly Media, 2016, Shroff Publishers, 2016, ISBN-13: 978-9352133741*
8. *Web References:*

   https://www.microsoft.com/en-in/sql-server/sql-server-2017

   https://www.mongodb.com/

KAD 2204 ANDROID APP DEVELOPMENT II

Course Code: - KAD 2204	Course Title: - Android App Development II DP	Credits: - 3

Course Description (CD)

This course evaluates the advanced features of Android application development. It included data management using SQLite and Content Providers. Design architectures such as MVC, MVP, and MVVM, employed in production scenarios. The REALM framework is used for Object Relationship Mapping (ORM). Advanced features such as AIDL services, Google Maps, Location-based services, Web service integration, text to speech, 2D and 3D graphics integration and animations are assessed and synthesized into robust solutions.

Learning Outcomes		Cognitive Level
LO1	Solve problems using SQLite and Content Providers	Apply
LO2	Design and create applications using predominant android architectures	Create
LO3	Create solutions based on the REALM framework.	Create
LO4	Create solutions based on advanced Service concepts, location and multimedia components, web services	Create
LO5	Analyze and apply 2D and 3D components in projects	Apply

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**					**1**		
LO2		**1**			**1**			
LO3	**1**					**1**		
LO4		**1**		**1**				
LO5						**2**		**1**

Module I

Recap: Introduction to Android Development I & II. SQLite. Database Integration: Introducing SQLite , SQLiteOpenHelper and creating a database , Opening and closing a database , Working with cursors Inserts, updates, and deletes , SQLite API ,SQLite Spinner , SQLite ListView . Content Providers & Services : Content Providers , Accessing built in content providers , Content provider MIME types , Searching for content, Adding, changing, and removing content , Creating content provider , Working with content files .

Module II

Android design architectures: **MVC: -** Model, View, Controller**. MVP: -** Model, View, Presenter**. MVVM: -** Model, View, View, Controller. Features & Advantages. **Realm :-**Basics, Advantages, POJO‟s, RealmObjects – Supported Types , Realm Instances & Objects, Realm Configurations, , Annotations „@‟, Realm Controllers, Realm Adapters , Realm Transactions, Important Classes.

Module III

Services: Overview of services in Android, Implementing a Service, Service lifecycle, Inter Process Communication (AIDL Services), Android Service API, Multimedia in Android: Multimedia Supported audio formats, Simple media playback, Supported video formats, Simple video playback. Location Based Services and Google Maps: Using Location Based Services, Working with Google Maps.

Module IV

Web Services and WebView: Consuming web services, Receiving HTTP Response (XML, JSON), Parsing JSON and XML. Using WebView, Sensors: How Sensors work, Sensor API. Best practices for performance. WiFi: Monitoring and managing Internet connectivity. Telephony Services: Making calls, Accessing phone properties and status, Sending messages, Send Email.

Module V

Camera: Taking pictures. Speech API: TextToSpeech, Bluetooth: Controlling local Bluetooth device, Discovering and bonding with Bluetooth devices. Animation: Android Animation API. Android Graphics: Graphics API, 2D Graphics, Canvas, Paint class. Android Application Deployment on Android Play Store, Timeline in mobile phone development : Zero G, 1G , 2G, 3G, 4G , (4G LTE, VoLTE) and 5G, Future of Android.

REFERENCES

1. *Micheal Burton, Android* App Development for Dummies, *3/e, John Wiley & Sons, 2015, ISBN-13:978-1118387108.*
2. *Lauren Dracy, Shane Conder,* Android Wireless Application Development-Advanced Topics, Volume II, *Addison-Wesley Professional, 2012, ISBN-13:978-0321813848*
3. *Joseph Annuzzi Jr,* Advanced Android Application Development, *Addison-Wesley Professional, 2014, ISBN-13:978-9332552012*
4. *Erik Hellman,* Android Programming: Pushing the Limits, *John Wiley & Sons, 2014, ISBN-13:978-8126547197.*
5. *Mark Wickham.,* Practical Android: 14 Complete Projects on Advanced Techniques and Approaches,*1st edn, Apress, Jan 2018, ISBN-13: 978-1-4842-3333-7*
6. *Reto Meier,* Professional Android, *4th edition, Wrox;, April 2018, ISBN-13: 978- 1118949528*

7. *Barry Burd,* Android Application Development All-in-One For Dummies, *Second edition, Wiley, 2015, ISBN-13: 978-8126557943*

KAD 2205 CLOUD AND ADVANCED TECHNOLOGIES

Course Code: - KAD 2205	Course Title: -Cloud And Advanced Technologies DP	Credits: - 4

Course Description (CD)

This course aims to provide an in-depth analysis of Cloud and related technologies. Various cloud architectures are analyzed and classified which enables students to apply the knowledge in designing cloud-based solutions in software development. The core contents discussed in this course are cloud architectures and service models like SaaS, PaaS, IaaS, FaaS, BaaS, and mBaaS. Evaluating Amazon Lambda, Firebase and DynamoDB provide students a portal to manage cloud solutions in real-world scenarios.

Learning Outcomes		Cognitive Level
LO1	Evaluate and analyze different cloud service providers, and various cloud service models (FaaS, BaaS)	Analyze
LO2	Assess and create various cloud service modes (SaaS, PaaS, and IaaS), and deploy solutions based on the model	Create
LO3	Design and create solutions in Amazon Lambda	Create
LO4	Evaluate mobile backend services (mBaaS) and its applications	Evaluate
LO5	Apply cloud solutions on production scenarios using Firebase or DynamoDB	Apply

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**							
LO2						**1**	**1**	
LO3	**1**	**1**			**1**			
LO4		**1**				**1**		
LO5	**2**					**1**	**2**	

Module I

Introduction to cloud computing- evolution, benefits, challenges, Transition from client server model to cloud architecture, cloud computing models, Popular cloud

services-Microsoft azure, Amazon Web Services(AWS), Google Cloud, Comparison.

Module II

Service Models: Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS),

Deployment Models: Private cloud, Community Cloud, Public cloud, Hybrid Cloud

Module III

Micro services - Introduction, purpose, architecture, examples, Serverless computing-Function as a Service (FaaS), Backend as a Service (BaaS), Application in AWS Lambda, DynamoDB and API Gateway, Hybrid approaches.

Module IV

Mobile Backend as a Service (mBaaS) - Google Firebase, IBM Cloudant, Apple CloudKit

Database-as-a-Service (DBaaS) – Introduction, benefits, Comparison of some DBaaS solutions: Amazon Relational Database Service (RDS), Microsoft SQL Database, Cloud SQL.

Module V

Hands on experience in Cloud hosting for each service - PAAS, SAAS and IAAs. Implementation using real-world examples.

REFERENCES

1. *Sandeep Bhowmik,* Cloud Computing, *Cambridge University Press, 2017, ISBN-13: 978- 1316638101*
2. *Ikram Hawramani,* Cloud Computing for Complete Beginners: Building and Scaling High- Performance Web Servers on the Amazon Cloud, *Hawramani.com publishing, 2016, ISBN- 13: 978-1520633169*
3. *Ian Foster and Dennis B. Gannon,* Cloud Computing for Science and Engineering (Scientific and Engineering Computation), *MIT Press, 2017, ISBN-13: 978-0262037242*
4. *Dan C. Marinescu,* Cloud Computing, Second Edition: Theory and Practice, *Morgan Kaufmann publishing, 2017, ISBN-13: 9780128128107*
5. *R. Chopra,* Cloud Computing: An Introduction, *Mercury Learning & Information, 2017, ISBN-13: 978-1683920922*
6. *Mitesh Soni , Manisha Yadav,* Learning Azure Functions: Build scalable cloud systems with serverless architecture, *Pact Publishing, 2017, ISBN-13: 978-1787122932*
7. *Tariq Farooq, Sridhar Avantsa, Pete Sharman* , Building Database Clouds in Oracle 12c, *Addison-Wesley Professional, 2016 , ISBN-13: 978-0-13-431086-2*
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https://aws.amazon.com/rds/ https://cloud.google.com/sql/docs/

https://cloud.oracle.com/home

KAD 2208 Software Lab-II (Android II & Database)

Course Code: - KAD 2208	Course Title: - Software Lab II (Android II & Database) LAB	Credits: - 2

Course Description (CD)

This course employs the concepts taught in the second semester for developmental purposes. NoSQL, MongoDB, and Android are used for providing robust solutions for real-world scenarios that enable students to understand the principles and functionalities behind each of the programming languages and its implementations respectively.

Learning Outcomes		Cognitive Level
LO1	Design Solution based on advanced android concepts	Create
LO2	Design solution based on NoSQL databases	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**					**1**	**1**	
LO2	**1**					**1**	**1**	

Android Advanced: Programs to familiarize these concepts

- Advanced Intent and Broadcast Receivers
- Content Providers and MIME Types
- Services
- Multimedia : Sound and Video
- Location : GPS and Internet, Proximity Alerts
- Google Map: Overlays , Geocoder.
- Web Views
- Sensors : Accelerometer, Motion , Compass, Orientation
- Telephone: Managing Calls.
- Contacts: Accessing Updating and Deleting.
- Email: Sending and Receiving.
- Camera: Surfaces Manipulation.
- Animations: 2D and 3D, OpenGL. Database & Backend

- NoSQL
- Mongo DB
- CURD

Note: - The Elective Subjects as Selected by the students will be covered as per

requirements.

REFERENCES

1. *Erik Hellman, Android Programming: Pushing the Limits, John Wiley & Sons, 2014, ISBN-13:978-8126547197.*
2. *Micheal Burton, Android App Development for Dummies, 3/e, John Wiley & Sons, 2015, ISBN-13:978-1118387108.*
3. *Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura,* Programming Android: Java Programming for the New Generation of Mobile Devices, *O'Reilly Media 2nd edition, 2012, ISBN-13: 978-1449316648*
4. *Lauren Dracy, Shane Conder,* Android Wireless Application Development Volume II: Advanced Topics: 2 (Developer's Library), *2012, ISBN-13: 978-0321813848*
5. *Joseph Annuzzi Jr, Lauren Darcey , Shane Conder ,* Advanced Android Application Development (Developer's Library), *ISBN-13: 978-9332552012*
6. *Guy Harrison,* Next Generation Databases: NoSQL and Big Data, *1st ed. Edition, Apress, 2015, ISBN-13: 978-1484213308*
7. *Cyrus Dasadia , Amol Nayak,* MongoDB Cookbook, *Packt Publishing , 2016, ISBN-13: 978-1785289989*

KAD 2209 Internship I - Android App Development

Course Code: - KAD 2209	Course Title: - Internship I – Android App Development	Credits: - 12

Course Description (CD)

The objective of this course is to provide real-world exposure to students. The students are required to attend at least 40 working days of internship in a reputed IT/Software development company and work in a live project. The project's scope includes android, backend, and related technologies. The goal here is to evaluate and design solutions that adhere to the highest industry standards and ethics.

Learning Outcomes		Cognitive Level
LO1	Evaluate client requirements efficiently	Evaluate
LO2	Analyze and prepare project plans, time and workflow management	Analyze
LO3	Design software requirement specifications accurately	Create
LO4	Design solutions based on SRS, and design principles	Create
LO5	Evaluate and modify the existing solution	Evaluate

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			**2**	**2**	**1**			
LO2		**1**	**1**	**1**				
LO3			**2**	**1**				
LO4						**2**		
LO5	**2**							**1**

Objective: To provide students with industrial exposure to real world of Android application development whereby they get an opportunity to apply the knowledge and skill acquired through the course.

The internship will be of 40 working days duration. The students are required to undertake the internship training with a reputed IT / Software Development Company on **Android Application** development or related technologies.

Student should submit the company details and work details to their concerned Faculty Guide for approval and feedback before the starting date stipulated by the center. The internship work will be duly evaluated continuously by the Faculty Guide. Students

have to produce a certificate of internship completion from the company at the time of rejoining the department, specifying the period of internship.

One copy of the final report, duly signed by the Faculty in Charge and the Director is to be submitted as part of completion of the Semester II. Individual presentation/demo of the work done and Viva voce is also included as a part of project evaluation.

Students are expected to adhere to highest standards of academic integrity. Specific instructions/guidelines for carrying out internship shall be prepared and given to the students by the center every year.

SEMESTER III

Sl. No.	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internals	End Semester	
1	KAD 2301	Entrepreneurship and New Venture Planning (G-T)	**3**	**2**	**0**	**50**	**50**	**3**
2	KAD 2302	Software Product Design & Agile Process Management. (G-T)	**3**	**2**	**0**	**50**	**50**	**3**
3	KAD 2303	Programming with Swift (D-P)	**2**	**2**	**2**	**50**	**50**	**3**
4	KAD 2304	iOS App Development – I (D-P)	**2**	**2**	**2**	**50**	**50**	**3**
5	KAD 2305	iOS App Development – II (D-P)	**2**	**2**	**2**	**50**	**50**	**3**
6	KAD 2306	Elective – III(G-T/D-T)*	**3**	**2**	**0**	**50**	**50**	**3**
7	KAD 2307	Elective – IV(D-T)	**3**	**2**	**0**	**50**	**50**	**3**
8	KAD 2308	Software Lab III (iOS & Swift) (LAB)	**0**	**0**	**6**	**50**	**50**	**3**
		Total				**800**		**24**

KAD 2301 Entrepreneurship and New Venture Planning

Course Code: - KAD 2301	Course Title: - Entrepreneurship and New Venture Planning GT	Credits: - 3

Course Description (CD)

The course provides an understanding of the nature of entrepreneurship while providing inputs about policy support and the legal aspects. Different facets of business plan preparation after idea generation and environmental analysis are discussed. Feasibility analysis methods and business model planning which play key roles in the success of new ventures are explained. Financing and valuation of new ventures have evolved into sophisticated areas of entrepreneurship management and are discussed in both global and Indian contexts.

Learning Outcomes		**Cognitive Level**
LO1	Understand the practical steps involved in starting new ventures	Understand
LO2	Understand the financing, taxation regulations and legal requirements applicable to such ventures	Understand
LO3	Evaluate the different methods of valuation, feasibility analysis, business planning and business model development	Understand
LO4	To evaluate the modes of financing for securing adequate investment including tapping government support	Evaluate

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			**1**	**1**		**1**		
LO2			**1**	**2**				
LO3		**2**				**2**		
LO4						**1**		

Module I

Entrepreneurship, Entrepreneurs, Characteristics of Entrepreneurship, Personality traits and personal values of entrepreneurs, Creativity and entrepreneurship, Idea generation and environmental analysis, Entrepreneurship Ecosystem.

Module II

Entrepreneurship and Strategy, Business Models and Strategy, Innovation, Value proposition and market analysis, the Business Plan, Elements of the Business Plan, The Marketing and Sales Forecasting.

Module III

Feasibility analysis: market feasibility, financial Feasibility and technical feasibility, Business model planning, New Value creation.

Module IV

Valuation, New Venture Finance, Determining Financial Needs, Sources of Financing, debt financing, equity financing, crowd funding, Securing Investors and Structuring the Deal, Approaching Investors, Structuring the Deal, Negotiation Skills, Networking and entrepreneurship, Business Incubation, Legal and Tax Issues, Governmental support to start-ups.

Module V

Organising for start-ups, Legal incorporation- possibilities, Networking and Alliances, Organizing manufacturing and distribution – various operation models, Traditional Organizational Structure, Entrepreneurial Performance: The Balanced Scorecard.

REFERENCES

1. *David Butler,* Business Planning: A Guide to Business Start-Up*, Butterworth Heinemann, 2000, ISBN-13: 978-0750647069*
2. *Vasant Desai,* Dynamics of Entrepreneurship Development and Management*, Himalaya Publications, 2007, ISBN-13: 9788184884975*
3. *Saha, A. and Sharma, V,* Entrepreneurship and New Venture Creation*, Excel Books, 2008, ISBN-13: 978-8174466075*
4. *Peter Ferdinand Drucker,* Innovation and Entrepreneurship*, London, 1985.*
5. *Anjan Raichaudhuri,* Managing New Ventures: Concepts and Cases in Entrepreneurship*, PHI, 2010, ISBN-13: 978-8120341562*
6. *Clare Griffiths, and Brad Crescenzo*, My Start-Up Plan: The business plan toolkit*, Kindle edition, 2012.*
7. *Donald F. Kuratko, and Jeffrey Scott Hornsby,* New Venture Management: The Entrepreneur's Roadmap*, Pearson Education, 2008, ISBN-13: 978-013613032*

KAD 2302 Software Product Design & Agile Process Management.

Course Code: - KAD 2302	Course Title: - Software Product Design & Agile Process Management. GT	Credits: - 3

Course Description (CD)

This course evaluates various work-flow management principles, architectures, and tools. Kanban framework and tools are used for the project and work-flow management. In addition to Kanban, Agile and Scrum architectures are applied for project management scenarios. Open-Source and paid tools are used to provide management solutions for different project scenarios.

Learning Outcomes		**Cognitive Level**
LO1	Understand and evaluate various software product lifecycle, its implementation and different tools used for project management	Analyze
LO2	Understand the Agile software development framework	Understand
LO3	Analyze the Kanban project management framework	Analyze
LO4	Understand and analyze the principles and practices required for release, iteration planning, Customer tests, small and regular releases (Understand).	Understand
LO5	Apply Scrum-based project management	Apply

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			**1**	**1**				
LO2					**1**			
LO3			**1**	**1**	**1**			**1**
LO4			**2**	**2**		**2**		**1**
LO5			**2**	**2**	**1**			**1**

Module I

Introduction to software product lifecycle, Traditional approaches, Overview of agile software development, Agile Manifesto, Agile Development frameworks, Lean Software Development.

Module II

Principles and Practices, Kanban board and flow, Planning and Estimation, Process Improvement, Kanban metrics, Example for kanban project management.

Module III

Introduction, Principles and Practices, Requirements and User Stories, Release

Planning, Iteration Planning, Customer Tests, Small, Regular Releases. Pair Programming, Continuous Integration, Collective Code Ownership, Team Roles

Module IV

What is Scrum? Scrum benefits, Scrum framework, Sprints, Requirements and user stories, Product backlog, Estimation and Velocity, Scrum Team structures, Scrum Events, Artifacts, Planning principles.

Module V

Common Tools: Atlassian Jira, Active Collab, Wrike, Agilo for Scrum, Pivotal Tracker, Easy Redmine

Open Source Tools – MyCollab, Odoo, OpenProject, OrangeScrum, Taiga, Tuleap

Practical implementation of agile methodologies in Android/iOS App Development Environment.

REFERENCES

1. *Kenneth S. Rubin* , Essential Scrum: A Practical Guide to the Most Popular Agile Process,
   Addison-Wesley Professional, 2012, ISBN-13: 978-0137043293
2. *Marcus Hammarberg , Joakim Sunden* , Kanban in Action, *Manning Publications, 2014, ISBN-13: 978-1617291050*
3. *Robert K. Wysocki* , Effective Project Management: Traditional, Agile, Extreme, *Wiley, 2013, ISBN-13: 978-1118729168*
4. *Kenneth S. Rubin,* Essential Scrum: A Practical Guide to the Most Popular Agile Process, *Addison-Wesley, 2012, ISBN-13: 978-0137043293*
5. *Henry Hayes,* Agile Project Management: The Ultimate Guide to Agile Project Management and Software Development - Plus Tips & Tricks for Implementing Scrum!
   (Agile Project Management, Agile Development, Scrum), *CreateSpace Independent Publishing Platform, 2016, ISBN-13: 978-1540315380*
6. *John A Estrella , Rossetta Sornabala* , Agile Project Management for Mobile Application Development, *Agilitek Corporation, 2017 , ISBN-13: 978-0978435462*
7. *Web references:*
   https://opensource.com/article/18/2/agile-project-management-tools
   https://www.easyredmine.com/software/agile-management

KAD 2303 Programming with Swift

Course Code: - KAD 2303	Course Title: - Programming with Swift DP	Credits: - 3

Course Description (CD)

This course assesses the Swift framework and its implementations. The concept of data-structures, operators, flow-control, arrays, properties, instances, inheritance, protocols, generics, and extensions are applied to problems. The students get an in-depth understanding of Swift programming and this course acts in conjunction with the iOS app development I and II courses, to enlighten students into the world of professional iOS development.

Learning Outcomes		Cognitive Level
LO1	Understand the operators, data structures, inheritance, and error handling in Swift	Understand
LO2	Create programs based using class, methods, protocols, generics, flow control, operators, and functions	Create
LO3	Analyze access control and enumeration.	Analyze
LO4	Create extensions and their implementations	Understand
LO5	Create memory management and develop solutions based on it	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**					**1**		
LO2	**1**				**1**		**1**	
LO3	**2**							
LO4	**1**	**1**				**1**	**1**	
LO5						**2**		**1**

Module I

Introduction: History of Swift, Features, Benefits, Objective-C and Swift, Introduction to Xcode and the iOS Simulator. Data Types: Basic Data Types, Tuples, Optional Types, Enumerations. Basic Operators: Assignment Operators, Arithmetic Operators, Comparison Operators, Range Operators, Logical Operators, Strings and Characters: Strings, Common String Functions, and Interoperability with NSString, Collections: Arrays, Dictionaries, Copying the behavior of Arrays and Dictionaries.

Module II

Flow Control: Selection, Conditions, Boolean logic and IF Statements, Optionals, IF Let Statements, Testing for nil and Optional Bindings, Switch Statements, Range Operators; Looping: For-Loops, Nested Loops, For-in Loops, Half-Open Range Operators, While Loops and Repeat- While Loops, Functions: Defining and Calling a Function, Function Types, Nested Functions, Closures: Understanding Closures, Closure Functions of Arrays, Using Closures in our Functions.

Module III

Structures and Classes: Structures, Classes. Properties: Stored Properties, Computed Properties, type Properties, Property Observers, Methods: Instance Methods, Type methods, Subscripts. Inheritance: Understanding Inheritance, Types of Initializers, Deinitialization, Optional Chaining, Error Handling.

Module IV

Protocols and Delegates: Understanding Protocols, Protocols as Types, Protocol Inheritance, Class-Only Protocols, Protocol Composition, Understanding Delegates.
Generics: Understanding Generics, Implement Generic Functions, Implement Generic Functions using Multiple Parameters, Generic Types, Associated Types, Generic Subscripts.

Module V

Extension: Extension Syntax, Working with computed properties, methods, initializers and subscripts, Adding Protocol Conformance with an Extension, Protocol Extensions, Extensions with Generic Types, Access Control: Access levels, Access Control Syntax, Access control to classes, structures and enumerations, Assigning access levels to protocols and extensions.
Memory management: Automatic Reference Counting (ARC), Strong Reference Cycles between Class Instances, weak references, unowned references, Memory Safety, Understanding Conflicting Access to Memory.

REFERENCES

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1. *Jon Hoffman*, Mastering Swift 4 - Fourth Edition: An in-depth and comprehensive guide to modern programming techniques with Swift, *Packt publishing, 2017, ISBN-13: 978- 1788477802*
2. *Donny Wals*, Mastering iOS 11 Programming - Second Edition: Build professional-grade iOS applications with Swift 4 and Xcode, *Packt publishing, 2017, ISBN-13: 978- 1788398237*
3. *Keith Moon*, Swift 4 Programming Cookbook, Packt Publishing, 1 edition (September 28, 2017), ISBN-13: 978-1786460899
4. *Matt Neuburg*, iOS 11 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics *1st Edition*, O'Reilly Media; 1 edition (October 19, 2017), *ISBN-13: 978- 1491999318.*
5. *Chris Eidhof, Ole Begemann, Airspeed Velocity*, Advanced Swift: Updated for

Swift 4, CreateSpace Independent Publishing Platform*, 2016, ISBN-13: 978-1539154716*

6. *Matthew Mathias, John Gallagher*, Swift Programming: The Big Nerd Ranch Guide (2nd Edition), Big Nerd Ranch Guides*; 2 edition (December 8, 2016), ISBN-13: 978- 0134610610*
7. *Web Reference: https://developer.apple.com/swift/*

KAD 2304 iOS App Development – I

Course Code: - KAD 2304	Course Title: - iOS App Development – I DP	Credits: - 3

Course Description (CD)

The course explains the fundamentals of iOS development. The core concepts in this course are data-structures, cocoa, foundation frameworks, story-boards, MVC, developer-guidelines, user controls, views, controllers, pop-overs and toolbars. By evaluation of the fundamentals of iOS development, the students can design basic solutions in the production environment.

Learning Outcomes		Cognitive Level
LO1	Apply the Cocoa framework for iOS development	Apply
LO2	Understand the fundamentals of iOS (Understand).	Understand
LO3	Evaluate and create Story Board, MVC, Protocols and Delegates, View System, Controllers, and devise solution based on it	Create
LO4	Apply User Controls into projects (Apply).	Apply
LO5	Design and create projects based on multi-scene storyboards, toolbars, and pickers	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**						**1**	
LO2		**1**			**1**			
LO3	**2**					**2**		
LO4	**1**					**1**		
LO5				**1**			**2**	**1**

Module I

Introduction to iOS Platform, iOS Devices and the Apple Developer Tools, UI Guidelines to IOS, Introduction to Xcode and the iOS Simulator, Exploring the iOS Technology Layers, iOS Application Life Cycle, Cocoa Fundamentals-Application Classes, Data Type Classes and Interface Classes, Foundation Framework, iOS Coding Standards.

Module II

Introduction to Interface Builder and Storyboard, Creating User Interfaces,

Autolayout, Customizing the Interface Appearance, Connecting to Code, Outlets and Actions, Introduction to MVC Design Pattern, Implementing MVC with Xcode, Single View Application Template, Building Applications, Developer Guidelines.

Module III

Protocols and Delegates, Working with labels, Basic User Input and Output Using Text Fields, Text Views, Buttons, Image Views, Animation, Sliders, Steppers, Search Box, Switches and Segmented Controls.

Module IV

Web Views, Scrolling Views, Alert Controllers, System Sound Services, Vibrations, Tables and Split View Controllers and Collection View.

Module V

Multi-scene Storyboard, Passing Data between Scenes, Segues, PopOvers, Understanding the Role of Toolbars, Exploring Pickers.

REFERENCES

1. *Matt Neuberg,* iOS 11 Programming Fundamentals with Swift, *O'Reilly, 2017, ISBN- 13: 978-1491999318*
2. *Serhan Yamacli ,* Beginner's Guide to IOS 11 App Development Using Swift 4: Xcode, Swift and App Design Fundamentals, *Createspace Independent Publishing Platform; 1 edition, 2017, ISBN-13: 978-1977891754*
3. *Donny Wals,* Mastering iOS 11 Programming, *Packt Publishing Limited, 2017, ISBN-13: 978-1788398237*
4. *Molly K. Maskrey,* Beginning iPhone Development with Swift 4: Exploring the iOS SDK , *Apress; 4th ed. edition (27 November 2017), ISBN-13: 978-1484230718*
5. *Christian Keur and Aaron Hillegass,* iOS Programming: The Big Nerd Ranch Guide (6th Edition), *Big Nerd Ranch Guides; 6th Edition, 2017, ISBN-13: 978-0134682334.*
6. *Web Reference: https://developer.apple.com/*

KAD 2305 iOS App Development – II

Course Code: - KAD 2305	Course Title: - iOS App Development – II DP	Credits: - 3

Course Description (CD)

This course works in conjunction with the iOS app development I course and enables students to use advanced features of iOS. By assessing the storage mechanism, gestures and orientations the students can design robust solutions. The knowledge of media framework, social network integration, and background processing can be applied to make projects that cater to a wider range of customers. The universal application development and submission guidelines allow students to deploy projects into App-Store.

Learning Outcomes		Cognitive Level
LO1	Understand and evaluate the different data storage mechanisms and their implementation using Core Data and Key Chain functions	Create
LO2	Analyze touch and gestures, orientation and motion, tilt and rotation	Analyze
LO3	Create applications using Responsive User Interfaces, Advanced controllers, Background Processing, Testing, social networking integration, and web services	Create
LO4	Understand the Multimedia framework and its implementation	Understand
LO5	Understand and evaluate universal applications and Submission guidelines	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**				**1**			
LO2		**1**				**1**		
LO3	**2**					**2**	**2**	
LO4		**2**				**1**		**1**
LO5			**1**	**1**				**1**

Module I

Advanced Storyboards Using Navigation and Tab Bar Controllers: Navigation

Controllers, Tab Bar Controllers, Sharing Data between Tab Bar Scenes, Navigation Information using Table Views and Split View Controllers.

Module II

Introduction to Data Storage Mechanisms in iOS, Plist Files, File System Storage, Data Management using Core Data, Search Result Controller, Modeling in Core Data, Key Chain Storage.

Module III

Building Responsive User Interfaces: Designing Rotatable and Resizable Interfaces, Auto Layout, Programmatically Defined Interfaces, Size Classes and Stack View.
Touches and Gestures: Multitouch Gestures Recognition, Adding and Using Gesture Recognition. Sensing Orientation and Motion: Understanding Motion Hardware, Accessing Orientation and Motion Data, Sensing Orientation, Detecting Acceleration, Tilt and Rotation.

Module IV

Media Player Frameworks, Image Picker, Accessing and Playing the Music Library, Using the Address Book, Email, Social Networking, Ad Integration, Web Services.

Module V

Understanding iOS Backgrounding, Disabling Backgrounding, Handling Background Suspension, Using Task-Specific Background Processing, Building Universal Applications: Configuring a project as Universal, Universal Tools and Techniques, Submission Guidelines, Test Flight.

REFERENCES

1. *Matt Neuburg*, iOS 11 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics, *1st Edition, O'Reilly Media; 1 edition (October 19, 2017), ISBN-13: 978- 1491999318*
2. *Donny Wals,* Mastering iOS 11 Programming, *Packt Publishing Limited; 2nd Revised edition edition (27 October 2017), ISBN-10: 1788398238*
3. *Matt Neuberg,* iOS 11 Programming Fundamentals with Swift, *O'Reilly (6 October 2017), ISBN-13:978-1491999318*
4. *Christian Keur and Aaron Hillegass,* iOS Programming, *Big Nerd Ranch Guides; 6 edition (January 6, 2017), ISBN-13: 978-0134682334.*
5. *Rory Lewis, Laurence Moroney,* iPhone and iPad Apps for Absolute Beginners *, revised - Apress, 2014, ISBN-13 : 9781430263623*
6. *Web Reference: https://developer.apple.com/*

KAD 2308 Software Lab III (iOS & Swift)

Course Code: - KAD 2308	Course Title: - Software Lab III (iOS & Swift) LAB	Credits: - 3

Course Description (CD)

The goal of this course is to provide hands-on experience in using iOS and its related framework. The concepts taught in courses Programming with Swift, iOS app Development I and II are applied in production scenarios to provide in-depth knowledge and expertise in iOS framework and application development.

Learning Outcomes		Cognitive Level
LO1	Develop projects using the iOS framework	Create
LO2	Develop solutions based on advanced iOS frameworks	Create
LO3	Deploy Swift based projects	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**	**1**				**1**	**1**	
LO2	**2**	**1**				**2**	**2**	
LO3	**1**	**1**				**1**	**1**	

The Lab is based on the practical oriented papers Programming with Swift , iOS App development I & iOS App development II.

1. iOS App development I: Implement iOS apps using following basic concepts
   - Basic Concepts: Storyboard-Single, Multiscene, Code, Outlets, Segues and Patterns.
   - MVC: Single View Application Template.
   - Table View: Create, Edit, Delete, Cocoa Fundamentals
   - Controls: Labels, Text Views, Buttons, ImageViews, Animations, Sliders, Steppers, SearchBox, Switch, Segmented Controls.
   - Views: Web, Scrolling, Table, Split.
   - Navigation and Tab Bar Controllers, Sharing Data between Tab Bar Scenes
   - Table Views and Split View Controllers
   - AutoLayout and Responsive User Interfaces
   - Universal and Background-Ready Applications
2. iOS App development II: Advanced level expertise in iOS App development using following concepts and frameworks
   a. Data Storage: Files, Core Data, Key Chain Storage.

b. Search Result Controller
c. Touches and Gestures
d. Orientation and Motion
e. Image Picker and Media Player
f. Address Book, E-mail and Browser
g. Core Location and MapKit : Current location and Annotation
h. Geofencing events handling
i. Local and Push Notifications
j. Working with CloudKit
k. Familiarity with Extensions and 3D Touch

3. Swift: Familiarize the following swift programming concepts through iOS App development.
   - Basics: Scope & Lifetime, Namespace, Module, Instances.
   - Collections and Flow Control
   - Functions and Closures.
   - Optionals.
   - Structure and classes
   - Methods
   - Protocols and Delegates
   - Extensions
   - Generics

REFERENCES

1. *Matt Neuberg,* iOS 11 Programming Fundamentals with Swift, O'Reilly, 2017, *ISBN- 13: 978-1491999318*
2. *Serhan Yamacli ,* Beginner's Guide to IOS 11 App Development Using Swift 4: Xcode, Swift and App Design Fundamentals, *Createspace Independent Publishing Platform; 1 edition, 2017, ISBN-13: 978-1977891754*
3. *Jon Hoffman,* Mastering Swift 4 - Fourth Edition: An in-depth and comprehensive guide to modern programming techniques with Swift, *Packt publishing, 2017, ISBN-13: 978- 1788477802*
4. *Matt Neuburg,* Programming iOS 11: Dive Deep into Views, View Controllers, and Frameworks, *1st Edition, O'Reilly Media, January 2018, ISBN-13: 978-1491999226*
5. *Kyle Richter, Joe Keeley,* Mastering iOS Frameworks: Beyond the Basics, *Addison- Wesley Professional, 2015, ISBN-13 : 9780134052526*
6. *Donny Wals,* Mastering iOS 11 Programming - Second Edition: Build professional-grade iOS applications with Swift 4 and Xcode, *Packt publishing, 2017, ISBN-13: 978- 1788398237*
7. *Web Reference: https://developer.apple.com/*

SEMESTER IV

Sl. No.	Course No.	Name of the Course	P	Max. Marks	Credits
1	KAD 2401	Main Project (90 working days during Semester IV in an IT firm where students contribute to a live iOS/Android/Cross-platform app development) and Viva voce (Continuous Assessment – 100 marks, Final report – 100 marks & Viva-Voce – 100 marks)		300	24
		Total		**300**	**24**

KAD 2401 Main Project (Mobile App Development)

Course Code: - KAD 2401	Course Title: - Main Project (90 working days during Semester IV in an IT firm where students contribute to a live iOS/Android/Cross-platform app development)	Credits: - 24

Course Description (CD)

To provide students with industrial exposure to real-world of Mobile Application development whereby they get an opportunity to apply the knowledge and skill acquired through the course. The Project will be of 90 working days of duration in a reputed IT / Software firm where students contribute to a live iOS / Android / Cross-platform application development and related technologies.

Learning Outcomes		Cognitive Level
LO1	Evaluate client requirements efficiently	Evaluate
LO2	Design software requirement specifications accurately	Create
LO3	Analyze and Apply time, workflow management, prepare project plans	Analyze
LO4	Develop solutions based on SRS, and design principles	Create
LO5	Evaluate and modify the existing solutions	Evaluate

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			**2**	**2**				
LO2					**2**	**2**		
LO3	**2**			**3**				
LO4			**3**					
LO5		**1**				**3**	**2**	**1**

Objective: To provide students with industrial exposure to real world of Mobile Application development whereby they get an opportunity to apply the knowledge and skill acquired through the course.

The Project will be of 90 working days of duration in a reputed IT / Software firm where students contribute to a live iOS / android / Cross-platform application development and related technologies.

Student should submit the company details and work details to their concerned Faculty Guide for approval and feedback before the starting date stipulated by the centre. The project will be duly evaluated continuously by the Faculty Guide. Students have to produce the project completion certificate from the company specifying the period of project work before submitting the report.

Project evaluation consists of following three components:

(i) Continuous assessment of the work: Students should send a weekly status report specifying the work progress in detail to the concerned Faculty Guide by the evening of the last working day in the week. In order to monitor the progress, students should attend review meetings and discussions with concerned Faculty Guide as required or as directed by the guide.

(ii) Evaluation of Project Report: One copy of the final project report duly signed by the Faculty in charge and Director is to be submitted for evaluation. The project explanation should contain minimum following technical components:

- Software Requirement Specification (SRS).
- Data Flow Diagram (DFD), if applicable.
- Design Principles/Models/UI designs
- Implementation details
- Results/Output Screens.

(iii) Viva-voce and presentation: Individual presentation/Demo of the completed project is also included as a part of project evaluation. Viva-voce examination will be carried out by a board of examiners comprising experts in mobile phone app development, and the board will evaluate and assess each student for their domain knowledge and skill set acquired from the course.

Students are expected to adhere to highest standards of academic integrity. Specific instructions/guidelines for carrying out internship shall be prepared and given to the students by the centre every year.

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List of Electives

1. Wearable Technologies in Android
2. Cross Platform Development Using React Native
3. iOS App Development - Advanced Technologies
4. Watch OS Programming.
5. HomeKit and HealthKit programming
6. Retail App Development Frameworks
7. Programming with Objective-C
8. Programming with Python
9. Data Analytics and its Applications
10. Kotlin Programming
11. IoT and its Applications.
12. Low Code Platform.

Elective 1: Wearable Technologies in Android

Course Description (CD)

This course aims to provide an in-depth understanding of the concepts of android wearable programming and related technologies. The course assesses the android wearable (watch) architectures and functionalities including watch faces, watch face API, activity tracker, supported graphics, call and SMS handling, UI guidelines, notifications, fragments, synchronizations. The students can apply the abovementioned features in various projects.

Learning Outcomes		**Cognitive Level**
LO1	Understand the android wearable environment	Understand
LO2	Develop applications using watch faces	Create
LO3	Deploy solutions based on watch face graphics	Create
LO4	Understand and analyze the controlling of android phone features in a wearable unit	Understand
LO5	Evaluate the data synchronization techniques and develop applications based on it	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			**1**	**1**				
LO2	**1**					**1**		
LO3		**2**						
LO4						**2**	**1**	
LO5	**2**							**1**

Module I

Introduction to Android OS: OS Layers, Android Architecture, Introducing to ADT, Application Framework. Introduction: SmartWatch Revolution, Android Wear Watched. Setting up the Environment: Android 5 Wearable Application Development. New Features: Familiarization of the Features. Exploring Android Studio: IntelliJ IDEA, Setting Up Emulators, Face Design, Concepts and Considerations.

Module II

Introduction to Program Faces: Watch Face Code Foundation, Timing: Timing Engines using TimeZone Times, Broadcast Receivers. WatchFace API: Implement a sample WatchFace API Method.

Module III

Android Wear Activity Tracker, Smart Watch as Input. WatchFace Design: Vector Graphics for Watch Faces, Bitmap Design using Raster Graphics. Multiple Mode Assets.

Module IV

Multimedia: Telephone Call Handling, Gmail, SMS, Hangout Wear Mini Launcher, Wear Internet Browser. Working with Fitness devices. UI Design Guidelines, Cards: - Fragments, frames, scroll view, Confirmations.

Module V

Voice & Notification: Notification Framework, Stacked Noification, Custom Notification, Voice input from notification, Ongoing Notification. Data Layer API: google play service, one way message, synchronizes data. Testing: Hardware Devices in Android Studio, WearWatches Vs GoogleGlass. The Future Form Factors. Future : Google Glass, Android TV, Advanced Trends in wearable design.

REFERENCES

1. *Ashok Kumar S,* Android Wear Projects, *Packt Publishing, 2017, ISBN-13: 978- 1787123229*
2. *Wallace Jackson,* Pro Android Wearables: Building Apps for Smart watches, *Apress, 2015, ISBN-13: 9781430265511*
3. *Siddique Hameed, Javeed Chida,* Mastering Android Wear Application Development
   PACKT Publication, 2016, ISBN-13: 978-1785881725
4. *Andres Calvo,* Beginning Android Wearables With Android Wear and Google Glass SDKs, *Apress, 2016, ISBN-13: 978-1484205181*
5. *Andres Calvo,* Beginning Android Wearables, *1st edition, Apress;, 2015, ISBN-13: 978- 1484205181*
6. *Steven F. Daniel,* Android Wearable Programming, *Packt Publishing, 2015, ISBN-13: 978-1785280153*

Elective 2: Cross Platform Development Using React Native

Course Description (CD)

This course provides insight into the cross-platform application development using React Native. The fundamental differences between cross-platform, hybrid and native applications are highlighted. The core components such as React Native environment, user controls, testing and debugging, geolocation, camera and images, flashcards, transitions, state management, storage, and navigation. The application of these components in projects provides in-depth knowledge about cross-platform development.

Learning Outcomes		**Cognitive Level**
LO1	Assess the difference between native, hybrid and cross-platform application development	Analyze
LO2	Understand the architecture used in React Native	Understand
LO3	Develop applications based on user controls	Create
LO4	Apply the debugging and testing functionalities	Apply
LO5	Develop application using a third party, geolocation, states, storage and navigation components	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**		**1**					
LO2						**1**	**1**	
LO3	**1**							
LO4		**1**					**2**	
LO5	**2**					**1**	**1**	

Module I

Introduction: Different types of Mobile app development platforms: Native, Hybrid, Web applications, “Native” cross-platform apps, Hybrid HTML5 cross-platform apps, Advantages of cross-platform apps. Introduction to React Native, History of React Native, Motivation behind creating React Native App. React Native vs hybrid applications. React Native: Information flow, Architecture, Threading model. React Native benefits.

Module II

Setting up an environment for developing iOS and Android apps, Introduction to JSX, Creating your First Application with create-react-app and Expo, Stateful versus presentational components, React lifecycle methods, The folder structure

React Native Components: Basic components: View, Layouting, Touch events, Accessibility, Text, StatusBar, Images, and media.Basic user interaction: Button, TouchableOpacity, TouchableHighlight, TouchableWithoutFeedback. ActivityIndicator, Modal, ListView, ScrollView, RefreshControl, FlatList SectionList, VirtualizedList, Embedding web content, Handling user input,TextInput,Restricted choice inputs, Platform-dependent components, Detecting specific platform, Extensions, DatePickerIOS, Progress bars, Additional controls

Module III

Debugging and Testing React Native: Debugging your React Native apps, Remote debugging, Logging, Inspecting React Native components. Testing: Introduction to the Jest testing framework, Snapshot testing your React Native components, working with functions, mocking modules

Module IV

Platform APIs: Using Geolocation, Accessing the User‟s Images and Camera, Storing Persistent Data with AsyncStorage, Modules and Native Code, Installing Third-Party Components with Native Code, Writing an Objective-C Native Module for iOS, writing a Java Native Module for Android, Cross-Platform Native Modules

Module V

Navigation and Structure in Larger Applications: The Flashcard Application: Project Structure, Application Screens, Reusable Components, Styles, Data Models, Using React-Navigation, Creating a StackNavigator, Using navigation.navigate to Transition between Screens, Configuring the Header with navigation options, implementing the RestState Management in Larger Applications, Using Redux to Manage State, Actions, Reducers, Connecting Redux, Persisting Data with AsyncStorage, Flexbox styling concepts and techniques, Best practices and techniques for styling your React Native applications

REFERENCES

1. *Vladimir Novick,* React Native - Building Mobile Apps with JavaScript, *PACKT Publishing Limited, 2017, ISBN-13: 978-1787282537*
2. *Bonnie Eisenman*, Learning React Native, 2nd Edition, Building Native Mobile Apps with JavaScript, *O'Reilly Media Inc., 2017, ISBN-13: 978-9352136568*
3. *Eric Masiello, Jacob Friedmann,* Mastering React Native, *Packt Publishing, 2017, ISBN- 13: 978-1785885785*
4. *Stan Bershadskiy, Crysfel Villa,* React Native Cookbook, *Packt Publishing, 2017, ISBN- 13: 978-1786462558*
5. *Emilio Rodriguez Martinez,* React Native Blueprints: Create eight exciting native cross- platform mobile applications with JavaScript, *Packt Publishing,*

2017, ISBN-13: 978- 1787288096

6. *Web References: https://facebook.github.io/react-native/ http://www.reactnative.com/*

Elective 3: iOS APP DEVELOPMENT – ADVANCED TECHNOLOGIES

Course Description (CD)

The course explains the advanced concepts of iOS development. The core concepts in this course are managed objects, controllers, encoding and decoding, serialization, map views, geolocation, push notifications, CloudKit, and apple watch extensions. The students can design complex projects by applying the features mentioned above.

Learning Outcomes		**Cognitive Level**
LO1	Develop applications using Managed Objects and Serialization	Create
LO2	Deploy the application using Map and Geolocation components	Create
LO3	Differentiate Notifications in iOS and its implementation	Analyze
LO4	Evaluate cloud kit and data management	Evaluate
LO5	Apply extensions to existing android projects	Apply

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**2**					**1**	**1**	
LO2		**2**				**1**	**1**	
LO3	**1**							
LO4	**2**					**1**		
LO5			**1**	**1**			**1**	**1**

Module I

Introduction to Core Data, Building Managed Object Model, Setting Up Default Data, Displaying Managed Objects, Introducing the Fetched Results Controller, Adding, Editing, and Removing Managed Objects, Encoding, Decoding and Serialization, JSON Encoder.

Module II

Introduction, Creating and Interacting with Map View, Overlay Views, Annotations, Polyline, Polygon and Circles.

Location Manager and Permissions. Registering Geofences. Reacting to Geofence Events, Notifying User of Geofence Event.

Module III

Differences Between Local and Push Notifications, App Setup, Creating Development Push SSL, Certificate, Development Provisioning Profile, Custom Sound Preparation, Registering for Notifications, Scheduling Local Notifications, Receiving Notifications, Push Notification Server, Sending the Push Notifications

Module IV

CloudKit Basics, Setting Up a CloudKit Project, CloudKit Concepts, CloudKit Basic Operations, Subscriptions and Push, User Discovery and Management, Managing Data in the Dashboard.

Module V

Types of Extensions, Understanding Extensions, API Limitations, Creating Extensions, Today Extension, Sharing Code and Information between Host App and Extension, Apple Watch Extension, 3D Touch, Search, Siri, Touch ID, Certificate Creation, Apple Pay

REFERENCES

1. *Matt Neuburg ,* iOS 11 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics,*O'Reilly Media; 1 edition, 2017, ISBN-13: 978-1491999318*
2. *Christian Keur, Aaron Hillegass,* iOS Programming: The Big Nerd Ranch Guide (6th Edition), *Big Nerd Ranch Guides, 2017, ISBN-13: 978-0134682334.*
3. *Donny Wals ,* Mastering iOS 11 Programming , Packt Publishing Limited; 2nd Revised edition, *2017, ISBN-13: 978-1788398237*
4. *Matt Neuburg,* Programming iOS 11: Dive Deep into Views, View Controllers, and Frameworks, *1st Edition, O'Reilly Media, January 2018, ISBN-13: 978-1491999226*
5. *raywenderlich.com Team, Janie Clayton, Alexis Gallagher, Matt Galloway, Ben Morrow, Cosmin Pupaza, Steven van Impe,* Swift Apprentice: Beginning Programming with Swift 4, *Third Edition, Razeware LLC, 2017, ISBN-13: 978-1942878438*
6. *Kyle Richter, Joe Keeley,* Mastering iOS Frameworks: Beyond the Basics, *Addison- Wesley Professional, 2015, ISBN-13 : 9780134052526*
7. *Web Reference: https://developer.apple.com/*

Elective 4: Watch OS Programming

Course Description (CD)

This course assesses the WatchKit and architectures that support Apple Watch development. It includes an in-depth understanding of WatchKit, Interface controllers, Navigation, Life Cycle, user control, localization, synchronization, notification, and testing.

Learning Outcomes		**Cognitive Level**
LO1	Understand Apple Watch and its lifecycle	Analyze
LO2	Evaluate storyboard and navigation	Assess
LO3	Understand the user controls and its implementation	Understand
LO4	Develop application using localization and synchronization	Create
LO5	Understand and create Notification and Testing	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1		**1**	**1**	**1**				
LO2						**1**	**1**	
LO3	**1**				**1**			
LO4	**2**					**2**	**2**	
LO5	**1**					**1**	**1**	**1**

Module I

WatchKit App Architecture, Interaction between Apple Watch and iPhone, Types of Apple Watch Applications, WatchKit App Lifecycle.

Module II

Interface Controllers and Storyboard, Life Cycle of an Interface Controller, Navigation between Interface Controllers, Hierarchical Navigation, Page-Based Navigation, Passing Data between Interface Controllers.

Module III

Button, Switch, Slider, Labels, Images, Tables, Text, Emojis, Laying Out Controls, Force Touch, Context Menu.

Module IV

Localization-User Interface, Strings, Date Control.

Communicating between the WatchKit App and the Extension-Location Data, Displaying Maps, Accessing Web Services, Sharing Data.

Module V

Notifications-Types of Notifications on Apple Watch and its Implementation.

Glances-Implementation, Customization and Testing of Glance and Glance Updation.

Advanced Technology: TV OS.

REFERENCES

1. *raywenderlich.com Team, Ehab Amer, Scott Atkinson, Soheil Azarpour, Matthew Morey, Ben Morrow, Audrey Tam, Jack Wu,* watchOS by Tutorials: Making Apple Watch Apps with watchOS 4 and Swift 4, *Razeware LLC, 3rd edition, 2017, ISBN-13: 978- 1942878452*
2. *Scott La Counte* , A Beginners Guide to Apple Watch Series 2 and Watchos 3,
   Createspace Independent Publications, 2016, ISBN-13: 978-1537740546.
3. *Steven F. Daniel,* Apple Watch App Development, *Packt Publishing, 2016, ISBN-13: 978- 1785886362*
4. *Jeff Kelley,* Developing for Apple Watch: Create Native watchOS Apps with the WatchKit SDK, *Pragmatic Bookshelf; 2 edition, 2016 , ISBN-13: 978-1680501339*
5. *Wei-Meng Lee,* Learning WatchKit Programming: A Hands-On Guide to Creating watchOS 2 Applications, *Addison-Wesley Professional, 2 edition, 2015, ISBN-13: 978- 0134398983*
6. *Web Reference:*
   https://developer.apple.com/library/ios/documentation/General/Conceptual/WatchKitProgrammingGuide

Elective 5: HomeKit and HealthKit Programming

Course Description (CD)

This course evaluates two tools supported by iOS and they are HomeKit and HealthKit. The HealthKit provides an interface to monitor health conditions using Apple devices, and it includes, HealthKit design philosophy, sampling, threading, digital signatures, and classes. The HomeKit allows interfacing the home appliances with Apple devices and includes managed objects, room, and home services, bridging, delegates and observables, services, accessory management, action-sets, and triggers.

Learning Outcomes		**Cognitive Level**
LO1	Apply reading and writing health kit data in projects	Apply
LO2	Understand advanced health kit functions like threading	Understand
LO3	Understand HomeKit and its application	Understand
LO4	Apply Observable and Delegates in the HomeKit framework	Apply
LO5	Understand various services and bridging techniques to other platforms	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**				**1**	**1**	**1**	
LO2						**2**	**2**	
LO3	**1**					**1**	**1**	
LO4	**2**			**1**			**2**	
LO5		**1**	**1**					**1**

Module I

Introduction to HealthKit App, Adding HealthKit to a Project, Requesting Permission for Health Data Reading, Characteristics of HealthKit Data, Reading and Writing Basic HealthKit Data, Reading and Writing Complex HealthKit Data.

Module II

HealthKit and Privacy, Benefits from Adopting HealthKit, HealthKit‟s Design Philosophy, Setting Up HealthKit, Adding Samples to the HealthKit Store, Managing Sample Sizes, Working with Units, Threading, Adding Digital Signatures, HeathKit Classes, Development of HealthKit Apps.

Module III

Introduction to HomeKit, Enabling HomeKit, Getting the Home Layout, Getting the Home Manager Object, Getting the Primary Home and Collection of Homes, Getting the Rooms in a Home, Getting the Accessories in a Room, Getting Accessories in a Home, Rules for Naming Objects, Creating Homes, Adding a Room to a Home, Discovering Accessories, Adding Accessories to Homes and Rooms, Changing Names of Accessories, Adding Bridges to Homes and Rooms, Creating Zones.

Module IV

About HomeKit Delegation Methods, Observing Changes to the Collection of Homes, Observing Changes to Individual Homes, Observing Changes to Accessories, Getting Services and Their Properties, Changing Names of Services, Accessing Values of Characteristics, Creating Service Groups.

Module V

Adding Accessories, Adding Services to Accessories, Adding Characteristics to Services, Adding Accessories to a Home, Controlling Accessories, Adding Bridges, Adding Bridges to a Home, Controlling Accessories Behind a Bridge, Testing Multiple iOS Devices and Users**,** Creating Write Actions, Creating and Executing Action Sets, Creating and Enabling Timer Triggers, Adding and Removing Users, Getting User Names.

REFERENCES

1. *Jesse Feiler,* Learn Apple HomeKit on iOS: A Home Automation Guide for Developers, Designers, and Homeowners, *Apress, 2016, ISBN-13: 978-1484215289.*
2. *Michael Galeso ,* Apple Homekit: An Easy Guide to the Best Features, *CreateSpace Independent Publishing Platform, October 2016, ISBN-13: 978-1539660156*
3. *Vandad Nahavandipoor,* iOS 11 Swift Programming Cookbook: Solutions and Examples for iOS Apps, *O'Reilly Media; 1 edition, 2017, ISBN-13: 978-1491992470.*
4. *Vandad Nahavandipoor,* iOS 8 Swift Programming Cookbook, *O'Reilly Media, November 2014, ISBN-13: 978-1491908693*
5. *Bakir, Ahmed, de la Torriente, Manny, Chesler, Gheorghe,* Program the Internet of Things with Swift for iOS, *Apress, 2016, ISBN-13: 978-1-4842-1194-6,*
6. ***Web References:*** *https://developer.apple.com/library/ios/documentation/NetworkingInternet/Conceptual/Ho meKitDeveloperGuide https://developer.apple.com/library/ios/documentation/HealthKit/Reference/HealthKit_Fr amework*

Elective 6: Retail APP Development Frameworks

Course Description (CD)

This course's goal is to provide a detailed understanding of the Retail framework. It includes wallets ecosystem and lifecycle, passes, localization, keychain, security considerations, Apple pay, and iBeacon services. The students can apply retail services into existing projects.

Learning Outcomes		**Cognitive Level**
LO1	Analyze the wallet ecosystem	Analyze
LO2	Understand about Pass system and its features	Understand
LO3	Analyze different features of Pass	Analyze
LO4	Apply Touch Id and Payment Token (Apply).	Apply
LO5	Understand the Bluetooth features of the kit	Understand

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1		**1**			**1**		**1**	
LO2	**1**			**1**				
LO3						**1**	**1**	
LO4	**2**					**2**		
LO5	**1**		**1**			**1**		**1**

Module I

Introducing Wallet, Wallet Ecosystem Design, Passes and Stages of Pass Lifecycle, PassKit Framework.

Module II

Creating and Populating the Pass Package, Setting the Pass Type Identifier and Team ID, Signing and Compressing the Pass, Changing the Offer, Viewing the Pass, Pass Design and Creation, Pass Styles, Designing Passes for Apple Watch, Fields Contain Text Displayed on the Pass, Fields Support Formatting, Barcodes Link Passes, Customization of Pass Colors, Handling Images, Relevance Information Displays Passes on the Lock Screen, Passes Support Localization, Passes Are Cryptographically Signed and Compressed, Debugging and distribution of Passes.

Module III

Updating passes, Overview of the Communication, Interacting with Passes, Enabling Passbook Capabilities, Accessing, Getting, Reading, Adding, Changing and Removing a Pass.

Module IV

Using Touch ID with Keychain and Local Authentication, Security Considerations, LAContext. Apple Pay or In-App Purchase, Prerequisites, App Review Guidelines, Presenting the Apple Pay button, Presenting the Payment Sheet, The Payment Token, Supported Transaction Types, Best Practices.

Module

iBeacon Software: Core Location APIs, Broadcasting an iBeacon, Physical Limitations, UUID, Major, and Minor identifiers, Listening for iBeacon, Acting on Found, iBeacons, Notifications, Best Practices.

REFERENCES

1. *Ernest Bruce*, Apple Pay Essentials, *Packt Publishing*, *February 2016*, *ISBN-13: 9781785886386.*
2. *Allister Banks, Charles S. Edge*, Learning iOS Security, *Packt Publishing Limited, 2015, ISBN-13: 978-1783551743*
3. *Matthew S. Gast*, Building Applications with iBeacon: Proximity and Location Services with Bluetooth Low Energy 1st Edition, *O'Reilly Media; 1 edition (October 12, 2014), ISBN-13: 978-1491904572*,
4. *Craig Gilchrist*, Learning iBeacon, *Packt Publishing , November, 2014, ISBN-13: 978- 1784397128*
5. *Web References:*
   https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/PassK it_PG
   https://developer.apple.com/library/ios/ApplePay _Guide/
   https://developer.apple.com/ibeacon/Getting-Started-with-iBeacon.pdf

Elective 7: Programming with Objective-C

Course Description (CD)

The course provides fundamentals of Objective-C programming. It includes data-types, structures, functions, pointers, objects, class, memory management, foundation class, events, cocoa framework, event handling, exception handling, and dynamic lookup. The application of these features allows for seamless project development.

Learning Outcomes		**Cognitive Level**
LO1	Understand the variables and data-structures in Objective C	Understand
LO2	Apply Object-Oriented features	Apply
LO3	Evaluate advanced-structures and Object manipulation	Evaluate
LO4	Deploy applications using Error Handling and MVC	Create
LO5	Analyze Object features and Data Management	Analyze

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1							**1**	
LO2	**1**				**1**	**1**		
LO3		**1**	**1**	**1**				
LO4							**2**	
LO5	**2**							**1**

Module I

The Objective-C Language: Introduction, Programming Environment, Variables, Data Types and Expressions, Numbers, Pre-processor, Enumerated data types, Arrays, Blocks, Structures, Pointers and Addresses, Looping, Decision Making, Functions, Type conversions, Bitwise operators, Scope.

Module II

Object-oriented concepts: Classes, Objects, Methods and Messages, Properties, Object initialization, Inheritance, Polymorphism, Dynamic Typing, Dynamic Binding, Categories and Protocols, Class Extensions

Module III

The Foundation Framework: Introduction to the Foundation Framework, Numbers, Strings, and Collection, Working with Files, Memory Management and Automatic

Reference Counting, Copying Objects, Archiving, Collection Classes, Callbacks,

Module IV

Event-Driven Applications: GUI-based applications, Model-View-Controller, application delegate. Errors: Error Objects, Domains, and Codes, Using and Creating Error Objects, and Exceptions: Exceptions and the Cocoa Frameworks, Handling Exceptions, Throwing Exceptions, Nested Exception Handlers, Predefined Exceptions, Controlling a Program‟s Response to Exceptions.

Module V

The Objective-C Runtime: Basics, Dynamic method lookup and execution, Management of classes and inheritance hierarchies, Auto-release pool mechanism, Object Creation And Storage, Key-Value coding, Key-Value Observing and its working, Preventing Memory Leaks

REFERENCES

1. *Gibson Tang, Maxim Vasilkov,* Objective-C Memory Management Essentials, *Packt Publishing, March 2015, ISBN-13: 978-1849697125*
2. *Stephen G. Kochan,* Programming in Objective-C, Developer's Library, *Addison-Wesley Professional; 6 edition (December 13, 2013), ISBN-13: 978-0321967602*
3. *Wiley,* Objective-C Programming: Introduction to Programming for iOS, *Wiley February 2014, ISBN-13: 978-0672334498*
4. *Jesse Feiler,* Sams Teach Yourself Objective-C in 24 Hours, *Second Edition, Sams, March 2014, ISBN-13: 978-0672334498*
5. *Carlos Oliveira,* Objective-C Programmer's Reference, *Apress, November 2013, ISBN-13: 978-1430259053*
6. *Mikey Ward , Aaron Hillegass,* Objective-C Programming: The Big Nerd Ranch Guide,
   Big Nerd Ranch Guides, November 2013, ISBN-13: 978-0672334498
7. *Web Reference: https://developer.apple.com/documentation/objectivec*

Elective 8: Programming with Python

Course Description (CD)

This course evaluates the Python programming language. The students can apply python scripting using data-types, loops, operators, functions, class, objects, inheritance, overloading, exception handling, and library management in a development environment. The data analysis module assesses data preprocessing, descriptive statistics, file management, plotting, and visualizations. NumPy and related libraries are used for data analytics.

Learning Outcomes		**Cognitive Level**
LO1	Understand the fundamentals of Python and its environment	Understand
LO2	Understand syntax and semantics and advanced python integration	Understand
LO3	Understand advanced Class and Object-Oriented features and its implementation	Understand
LO4	Develop application using statistical and analytical features	Create
LO5	Design solutions based on visualization	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1								**1**
LO2		**2**		**1**		**1**		
LO3		**2**			**1**		**1**	
LO4		**1**				**1**	**1**	
LO5	**2**		**2**	**2**				

Module 1

Introduction to Python: Scripting language, Downside, Who Use Python, What can I do with python? Trade-off, Technical Strength. How Python Runs Programs? How You Run Programs? Installation & Configurations, Windows Launcher, Introducing Python Object Types: Numeric Type, The Dynamic Typing Interlude, String Fundamentals, List and Dictionaries, Tuples, Files and Others.

Module II

Introducing Python Statements: Assignments, Expressions, and Prints, if and Syntax Rules, while and for loops, Iterations and Comprehensions, Documentation Interlude. Functions and Generators: Function Basic, Scope, Arguments. Advance Functions,

Comprehensions and Generations, the Benchmarking Interlude.

Modules: The Big Picture. Module Coding Basics: Creation, Usage, Namespaces, Reload. Module Package: Setting, File, Import, Namespaces. Advanced Module Topics, OOP: The Big Picture. Class Coding Basics: Class, Object, Instance, Inheritance, Constructor, Testing, Behaviour methods, Operator Overloading, Subclassing, Customized constructor, Introspection Tools, Store Objects in database, Class coding details.

Module III

Operator Overloading, Designing with classes, Advanced Class Topics, Exception Basics, Exception Details: try, except, else, finally, raise, assert. Exception Objects: Exception Class, Hierarchy, Exception Details, and methods. Designing With Exceptions: Nesting, Idioms, Design Tips and Gotchas, Advanced Topics: Unicode and Byte Strings, Managed Attributes, Decorators, Metaclasses.

Module IV

Introduction to Data Analysis, Installation & Setup, Libraries. Interactive Computing and Development Environment: IPython Basics, Command History, Interacting with OS, Software Development Tools. NumPy Basics: Arrays and Vectorized Computation. Getting Started with pandas: Introduction, Functionality, Descriptive Statistics, Handling missing data, Hierarchical indexing. Data Loading, Storage, and File Formats: Read and Write text, Binary Data Formats, Interacting with Web API and Databases.

Module V

Data Wrangling Clean, Transform, Merge, Reshape: Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation, and String Manipulation. Plotting and Visualization: A Brief matplotlib API Primer, Plotting Functions in pandas, Plotting Maps: Visualizing Haiti Earthquake Crisis Data, Python Visualization Tool Ecosystem. Data Aggregation and Group Operations: GroupBy Mechanics, Data Aggregation, Group-wise Operations and Transformations, Pivot Tables and Cross-Tabulation. Time Series: Basics, DateRanges, Frequencies, and Shifting, Time Zone Handling, Periods and Period Arithmetic, Resampling and Frequency Conversion, Time Series Plotting. Financial and Economic Data Applications: Data Munging Topics , Group Transforms and Analysis.

REFERENCES

1. *Wes McKinney*, Python For Data Analysis, *O'Reilly Publishers, 2017, ISBN-13: 978- 1491957660*
2. *Mark Lutz* , Learning Python, *O'Reilly Publishers, 2013, ISBN-13: 978-1449355739*
3. *Jake VanderPlas*, Python Data Science Handbook: Essential Tools for Working with Data,
   Shroff/O'Reilly Publishers, 2016, ISBN-13: 978-9352134915
4. *Rick van Hattem*, Mastering Python, *Packt Publishing Limited, 2016, ISBN-13:*

978- 1785289729

5. *Armando Fandango,* Python Data Analysis, *Packt Publishing Limited, 2017, ISBN-13: 978-1787127487*
6. *Web Reference: https://www.python.org/*

Elective 9: Data Analytics

Course Description (CD)

This course provides an in-depth understanding and classifies data analytical methods. The students examine descriptive statistics in-detail such as uncertainty, probability, variances, time series and sampling. The regression analysis enables students to apply the concepts of least square, correlation, the goodness of fit, ANOVA, Latin square, and factorial design into solutions. Association rule mining, Bayesian, Random forest, K nearest neighbor, SVM, Fuzzy logic, and Neural Networks are some of the widely used models explained in this course.

Learning Outcomes		**Cognitive Level**
LO1	Understand the fundamentals of data management in data mining & analysis	Understand
LO2	Apply Descriptive statistics and sampling techniques	Apply
LO3	Evaluate regression analysis and the tools used for it	Evaluate
LO4	Understand the commonly used data analytics models	Understand
LO5	Develop solutions using the R platform	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1	**1**	**1**			**1**	**1**	**1**	
LO2	**2**			**1**		**2**		
LO3		**2**						
LO4	**1**							
LO5	**3**		**1**		**2**	**3**		**1**

Module I

Data & Data Science Process: - overview of a data science project. Data Storage Concepts: Files, Database, Internet Repos, Steams, Blobs. Exploring Data: understand types of data (time series, numerical, text, etc), Cleaning input data: Stemming, Tokenization, Stop word removal, Length Based selection, replacing nulls & missing data correction.

Module II

Descriptive Statistics: Uncertainty, probability, variance, sampling, randomness, elements of data analysis. Describing and displaying data, correlation. Joint probability distribution, Conditional probability distribution, prior and posterior probability distribution, Time series data. Sampling techniques & Measurement of Centre Values

Module III

Regression Analysis, Multicollinearity, Correlation analysis, Rank correlation coefficient, multiple correlation, Least square, Curve fitting and goodness of fit, Time Series: ANOVA, Latin square, Factorial Design.

Module IV

Bayesian, Regression Model, Random Forest, K nearest Neighbor, Association Rule Mining, Decision Trees, Pruning, Text Mining: Clustering, Market Basket, Support Vector Machine, Fuzzy Logic, Neural Network, Back Propagation Deep Learning.

Module V

Introduction to R: Installation , RStudio, Objects, Scripts, Vectors , matrices, Generating Data, Objects , Files, Packages, Read and process data, Special data types, Visualizing data, Basic statistics,Linear modelling, functions ,lists, loops, project management and workflows.

REFERENCES

1. *Anil Maheshwari*, Data Analytics, *McGraw Hill Education, 2017, ISBN-13: 978- 9352604180*
2. *Herbert Jones*, Data Analytics: An Essential Beginner's Guide to Data Mining, Data Collection, Big Data Analytics for Business, and Business Intelligence Concepts, *Createspace Independent Publishing, 2018, ISBN-13: 978-1985097971*
3. *Paul Kinley*, Data Analytics for Beginners: Basic Guide to Master Data Analytics,
   Createspace Independent Publishing, 2016, ISBN-13: 978-1539896739
4. *Remko Duursma*, A Learning Guide to R, *Jeff Powell & Glenn Stone*
5. *Torsten Hothorn, Brian S. Everitt*, A Handbook of Statistical Analyses, *Chapman and Hall/CRC, 2009, ISBN-13: 978-1420079333*
6. *John Maindonald, W. John Braun*, Data Analysis and Graphics Using R: An Example- Based Approach, *Cambridge University Press; 3 edition, 2010, ISBN-13: 978- 0521762939*

Elective 10: Kotlin Programming

Course Description (CD)

This course introduces Kotlin programming. The students assess Kotlin's development environment, its data structures, operators, control statements, Object-oriented concepts, layouts, events, menus, navigation, intents, broadcasts, threads, SQLite, media frameworks, maps and fingerprint authentications to get an in-depth understanding of Kotlin programming.

Learning Outcomes		**Cognitive Level**
LO1	Understand the fundamentals of Kotlin	Understand
LO2	Understand the variables, operators, control flow, and lambda	Understand
LO3	Analyze Object Oriented capabilities of Kotlin	Analyze
LO4	Understand and analyze the UI components in Kotlin	Understand
LO5	Design solutions based on advanced features in Kotlin	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1			**1**		**1**			
LO2	**1**			**1**		**1**	**1**	**1**
LO3	**1**		**1**		**2**	**1**		
LO4	**1**					**1**		
LO5		**1**				**2**	**2**	

Module I

Kotlin: - Introduction, Advantages & Disadvantages, Kotlin for Android, Kotlin for Server Side Development. Setting up Kotlin Environment (Android). Environment Familiarization: - User Interfaces, AVD, Emulator, Testing, Android Studio Code Editor. Android Architecture: Stack, Kernel, Runtime, Libraries.

Module II

Activities, Intents, Broadcast (Intents & Receivers), Service, Content Providers, Manifest, Resource, Gradle, Resource & Context. Kotlin: - Kotlin & Java, Java to Kotlin, Kotlin & Android Studio, Semi-Colon in Kotlin. Kotlin Datatypes , Kotlin Variables (Mutable & Immutable), Variable Declaration, Type Annotation & Inference, Nullable, Safe Call Operator, Not Null Assertion , Nullable Type and let Function, Elvis Operator, Type Casting & Checking. Operators & Expression: - Expression, Assignment, Arithmetic, Augmented Assignment, Increment &

Decrement, Equality, Boolean Logical, Range & Bitwise. Flow Control: - for – in, while, do – while, Break & Continue, Break & Continue Labels, if, if – else, if – else – if, when. Functions & Lambda: - Type, Return Values, Parameters, Variable Number, Lambda, Higher Order.

Module III

Basics Of OOP‟s, Inheritance & Sub classing, Activity Life Cycles, Activity State Changes, Save & Restore State, Views, View Groups & Layouts, Layout Editor, Constraint Layout, Constraint Layout Chain, Ratios, Constraint Set, Android Event Handling, Multi Touch Event Handling, Gesture Detector, Custom Gesture, Fragments, Menus & Overflow Menus, Animation & Transitions, Floating Action Button & Snackbar, Tab Layout, Recycler View & Card View, App Bar, Collapsing Toolbar, Navigation Drawer.

Module IV

Master – Details Flow, Android Intents , Broadcast Intent & Receivers, Thread & Async Task, Started & Bound Service, Remote Bound Service, Notification , Multi Windows Support, Split Screen & Freeform, SQLite, TableLayout, TableRow, Content Providers, Cloud Storage & Access Framework, Video View, MediaController, Picture in Picture, Video Recording & Image Capture, Runtime Permission Requests.

Module V

Google Maps API, Android Printing Framework, Custom Document Printing, Android App Links, Instant Apps , Android Studio Profiler , Android Fingerprint Authentication, Handling Different Devices & Displays, Signing Android App for Release, Gradle in android Studio.

REFERENCES

1. *Antonio Leiva* , Kotlin for Android Developers: Learn Kotlin while developing an Android App, *CreateSpace Independent Publishing, 2016, ISBN-13: 978-1530075614*
2. *Marcin Moskala, Igor Wojda* , Android Development with Kotlin, *Packt Publishing, 2017, ISBN-13: 978-1787123687*
3. *Dmitry Jemerov, Svetlana Isakova,* Kotlin in Action, *Manning Publications, 2017, ISBN- 13: 978-1617293290*
4. *Stephen Samuel, Stefan Bocutiu* , Programming Kotlin, *Packt Publishing Limited, 2017, ISBN-13: 978-1787126367*
5. *Milos Vasic,* Mastering Android Development with Kotlin, *Packt Publishing Limited, 2017, ISBN-13: 978-1788473699*

Elective 11: Internet of Things (IoT)

Course Description (CD)		
The course goal is to evaluate IoT and its related technologies. The core contents analyzed in this course are the IoT environment, Raspberry Pi, CoAP, MQTT, XMPP protocols, gateways, abstraction, architectures, security, and interoperability.		
Learning Outcomes		**Cognitive Level**
LO1	Understand the fundamentals of IoT, its application and commonly used tools	Understand
LO2	Analyze the Raspberry Pi tool and its features	Analyze
LO3	Understand the Constraint Application Protocol (CoAP) and its use	Understand
LO4	Understand the XMPP protocol and its features	Understand
LO5	Analyze and evaluate the protocols and architectures used.	Analyze

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1				**1**				
LO2		**1**	**1**		**1**	**1**	**1**	
LO3	**1**					**1**	**1**	
LO4	**1**				**1**		**1**	
LO5			**1**	**1**				**2**

Module I

IoT Overview, IoT Hardware, IoT Software, Technologies & Protocols, Common uses, IoT – Media, Marketing, Advertising. IoT – Environmental Monitoring, IoT – Manufacturing, IoT – Energy, Healthcare, Building, Transportation, Education, Government, Law & Consumer Applications. IoT Thingworx, IoT Cisco virtualized packet core, IoT Salesforce, IoT GE PREDIX, Eclipse IoT, IoT CONTIKI, IoT Identity Protection, IoT Liability.

Module II

Raspberry Pi: - Creating Sensor Project, actuator project, controller, camera. HTTP: - Http Support to sensor, actuator & controller. UPnP: - Introduction, Device description document, service description document, web interface, UPnP interface, Still image service, using camera.

Module III

CoAP:- HTTP Binary, Add CoAP to sensor, Add CoAP to actuator, Using CoAP in controller. MQTT: - Support for Sensor, support for actuator, support for controller.

Module IV

XMPP: - Basics, Support to a thing, additional layer of security, support to actuator, support to camera, support to controller, Connecting it all together.

Module V

IoT Service Platform: - Selection of Platform, clayster platform, interfacing using xmpp, creating control application. Protocol Gateways: - protocol bridging, abstraction model, clayster abstraction model, CoAP gateway architecture. Security & Interoperability: - Understanding risk, modes of attack, tools for security, need for interoperability.

REFERENCES

1. *Peter Waher,* Learning Internet of Things, *Packt Publishing, 2015, ISBN-13: 978- 1783553532*
2. *Adrian Mcewen,C nik H assimally,* Designing The Internet of Things, *John Wiley and Sons, 2015, ISBN-13: 978-8126556861*
3. *Arsheep Bahga, Vijay Madisetti,* internet of Things: A Hands-On Approach, *Orient Blackswan Private Limited, 2015, ISBN-13: 978-8173719547*
4. *Stephen Chin, James Weaver,* Raspberry Pi with Java: Programming the Internet of Things (IoT), *McGraw-Hill Education, 2015, ISBN-13: 978-0071842013*
5. *Madhur Bhargava,* IoT Projects with Bluetooth Low Energy: Harness the power of connected things, *Packt Publishing, 2017, ISBN-13: 978-1788399449*
6. *Web References:* https://www.tutorialspoint.com/internet_of_things/index.htm

Elective 12:Low Code Platform

Course Description (CD)

This course analyzes the fundamentals of the Low Code Platform and the tools required to implement it. The students apply data models, workflows, user input and decision, security models, and permissions to develop solutions based on Low Code Platform.

Learning Outcomes		**Cognitive Level**
LO1	Understand the fundamentals of the Low Code Platform and its features	Understand
LO2	Understand different data models and their functions.	Understand
LO3	Apply workflow, verification and error handling techniques	Apply
LO4	Apply visual workflow into projects	Apply
LO5	Deploy the application using security and permissions	Create

Mapping of course outcomes with programme outcomes - Low=1, medium=2, High=3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
LO1								
LO2								
LO3		**1**			**1**	**1**	**2**	
LO4		**1**			**1**	**2**		**1**
LO5		**2**	**3**			**3**	**1**	**2**

Module I

What is a low-code development platform? What Is Low-Code App Development? Background of Low-code. What are the benefits of a low-code development platform? A Brief History of Low-code Development Platforms, How to Choose a Low-code Platform (speed/stability) Building an Application Without Coding, Breaking Down the Low-Code Landscape, Low-code Myths, Featured Low-Code Development Platforms Reviews: (Appian, PowerApps, Mendix, outsystems, Google AppMaker, QuickBase, TrackvIA, Zoho Creator, Salesforce App CLoud)

Module II

Data model: Objects, Fields, and Relationships, Formula Functions, Salesforce.com Development Using Functions, All About Formula Fields, Database Essentials,

Database Security.

Module III

Workflow and Rules, Building a Workflow Rule and Actions: Step by Step, Workflow Rules: Real-World Examples, Enforcing Business Rules with Salesforce.com Validation Rules, Building an Effective Validation Rule, Security Model Impact, Error Condition Grouping, Existing Error Conditions, Unavailable Functions, Building Effective Approval Processes for the business, Entitlements, and Milestones to Drive Case Automation, Creating an Entitlement Record, Case Page Layout Considerations

Module IV

Why Visual Workflow? User Input and Decision Points, The Cloud Flow Designer, Developing a Visual Workflow, Creating a Custom Button to Start the Flow, Develop Friendlier Solutions with Custom Settings, Streamline Process with Publisher Actions, Using Web-to-Lead, Customizing the Look and Feel of Salesforce.com, report Filters

Module V

Applying the Proper Security Model to Support Your Solutions, Understanding the Salesforce.com Security Model, Object and Field Permissions, Record Access via Sharing, Practical Application of Security Elements, Field-Level Security, Object-Level Security, Using Permission Sets and Validation Rules, Record Access Through Sharing, Object Permission and Record-Sharing Overlap

Managing Salesforce.com Data with Data Loader, environment management and Solution deployment, Sandbox Model

REFERENCES

1. *Philip Weinmeister* , Practical Salesforce.com Development Without Code, *Springer Nature 2015, ISBN-13: 978-1484200988*
2. *Jason Ouellette,* Development with the Force.com Platform: Building Business Applications in the Cloud, *Addison-Wesley Professional, 2011, ISBN-13: 978-0321767356*
3. *Richard Wentk, Justin Davis,* Teach Yourself VISUALLY Salesforce.com, *John Wiley & Sons, 2013, ISBN-13: 978-1118551592*
4. *Rakesh Gupta,* Learning Salesforce Visual Workflow, *Packt Publishing Limited, 2015, , ISBN-13: 978-1785289835*
5. *David Taber,* Salesforce.com Secrets of Success: Best Practices for Growth and Profitability, *Prentice Hall, 2013, ISBN-13: 978-0133517392*
6. *Web References:*
   https://www.mendix.com/blog/low-code-development-answers-business-needs/
   https://www.quickbase.com/blog/a-brief-history-of-low-code-development-platforms *http://in.pcmag.com/cloud-services/115106/guide/the-best-low-code-development-* *platforms-of-2017*
   https://www.salesforce.com/products/platform/best-practices/application-

development- framework/
http://myyesm.com/salesfore-syllabus/
http://in.pcmag.com/zoho-projects/104878/feature/building-an-app-with-no-coding-myth- or-reality