SYLLABUS

M.Voc.

in

SOFTWARE APPLICATION DEVELOPMENT

According to Outcome-Based Education
with Choice Based Credit System
to be effective from 2025 admission onwards

DDU KAUSHAL KENDRA

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

KOCHI- 682022

2025-2026

DDU KAUSHAL KENDRA

Vision

"Empowering youth for a Skilled and Sustainable Nation"

Mission

Mission	Statement
M1.	Offer quality education in emerging vocational domains in technology and management
M2.	Imparting skills education to develop industry-ready employable professionals.
M3.	Promote entrepreneurial orientation and skills among the students
M4.	Inculcate innovation mind set to excel in the emerging dynamic, global economy.
M5.	Foster social commitment and sustainable business philosophy

Program Description

M.Voc in Software Application Development, a Masters level vocational programme offered under the DDU KAUSHAL Kendra, CUSAT is designed according to the UGC guidelines for vocational programmes based on NSQF with multiple entry/exit options, leading to various job roles at each exit point. Course curriculum is aligned with the norms of the concerned Sector Skill Councils for enabling the students to obtain skill certifications from the SSC concerned at various exit points. The job roles defined after completion of first year are Application Developer (Android) vide TEL/Q2300 and Web Developer vide SSCQ0503. After completion of the M.Voc degree the job roles assigned are: Application Developer (Native) vide TEL_Q2301 and Software Developer/Engineer vide SSCQ0501.

The program provides an excellent platform for students to develop their overall skills to build a career in the Software Application Development domain in the IT industry. The two-year structure of this program enables one to be a skilled professional in Web, Android, and iOS platforms. Students learn to write both cross-platform and native apps for Web, Android, iPhones, iPads, and Wearables. Managerial and entrepreneurial topics are integrated into the course curriculum. Special training for professional soft skills development is also included. By integrating the industry recommended "Domain Practical" approach with lecture mode of course delivery, software application and programming related subjects are taught through hands-on training in the classroom itself.

The Semester-1 is dedicated for general software development using Full stack technologies. The Semester 2 is dedicated for Android based App Development and its related technologies. The students must complete 40 working days of internship on Mobile/Web and related technology in a reputed company as part of the semester 2. The semester 3 is dedicated to iOS-based App Development and its encompassing technologies. The semester 4 consists of a 90 days internship in a reputed firm related to Android/iOS/Web development. The 90 days internship can be done using Native or Cross Platform technologies.

At least two general courses are included in first three semesters. As mandated by the UGC, a MOOC course with duration not less than eight weeks is made part of the syllabus and the students can take it up anytime during 2nd, 3rd or 4th semester. But, he/she has to successfully complete the same before the completion of the fourth semester. Since, the Software Application Development programme is mostly practical and lab oriented, it requires more time for delivering various courses and hence additional hours ae to be engaged on either working days or holidays to meet the total time requirements.

In order to enhance the skill acquisition of the students, it is recommended to have an internal project (non-credit) with three phases. The students may be encouraged to undertake an internal project/project with a social cause and shall complete it within the three phases. The phase 1 in the first semester, the students are required to identify their project, do requirement analysis, and develop the web component. During phase 2 in the second semester, the students are required to develop an android component for their project. In phase 3, the students should develop the iOS component for their project. Since this is not a mandatory requirement, this project has to be carried out parallelly with other courses during the programme.

The students have the flexibility to exit with a post graduate diploma certificate after one year, and they will get an opportunity to complete the course within five years of their original admission to M. Voc course.

Program Specific Objectives (PSO): Software Application Development

PSO	Description
PSO1	Analyze and synthesize the underlying structures of software/mobile applications by utilizing advanced programming constructs and tools to provide effective and sustainable solutions for software/mobile applications.
PSO2	Develop applications effectively in multidisciplinary teams to meet technological and societal goals of industry while managing the requirements for software/mobile application testing and deployment.
PSO3	Apply information technology principles to develop solutions that fulfill. social and ethical responsibility.

Programme Articulation Matrix

	M1	M2	M3	M4	M5
PSO1	3	3	3	3	1
PSO2	-	3	3	3	-
PSO3	-	-	3	3	3

Program Outcomes (PO): - Software Application Development

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

PO	Description
PO1	Demonstrate skills in developing software applications using Web, Android and iOS software platforms.
PO2	Analyze customer requirements to identify software requirements.
PO3	Demonstrate skills in applying relevant technology tools in Software/Mobile application development
PO4	Create solutions by using modern software tools and enhance effectiveness of application development process
PO5	Create solutions by utilizing modern software tools and enhance user Experience
PO6	Develop collaborative work and leadership skills for enhancing reliability of project execution
PO7	Develop adequate communication skills to aid project information flows and client satisfaction
PO8	Identify and select product and service opportunities in Software Industries

Mapping of POs with PSOs

Programme Outcome	PSO1	PSO2	PSO3
PO1	**3**	**3**	**1**
PO2	**3**	**3**	**1**
PO3	**3**	**3**	**1**
PO4	**3**	**3**	**2**
PO5	**3**	**2**	**2**
PO6	**3**	**3**	**-**
PO7	**1**	**1**	**-**
PO8	**1**	**2**	**3**

PROGRAMME STRUCTURE

FIRST SEMESTER

Slno	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internal	End Semester	
1	25-493-0101	Communication Skills Development (G-T)	3			50	50	3
2	25-493-0102	Fundamentals of Management (G-T)	3			50	50	3
3	25-493-0103	Object Oriented Programming and Web Technologies (G-P)	3		2	50	50	4
4	25-493-0104	Product Engineering (D-T)	4			50	50	4
5	25-493-0105	Algorithm and Data Structures (D-P)	2	1	2	50	50	4
6	25-493-0106	Database and Backend Technologies (D-P)	2	1	2	50	50	4
7	25-493-0107	Full stack Development (MERN Stack) (D-P)	2	1	2	50	50	4
8	25-493-0108	Software Lab I (Web, Kotlin, Git & SQL) (LAB)			8	50	50	4
		Total				**400**	**400**	**30**

SECOND SEMESTER

Slno	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internal	End Semester	
1	25-493-0201	Project Management (G-T)	3			50	50	3
2	25-493-0202	Android App Development - Kotlin & XML (D-P)	3		2	50	50	4
3	25-493-0203	Android App Development - JetPack Compose (D-P)	3		2	50	50	4
4	25-493-0204	Cloud and Advanced Technologies (D-P)	1		4	50	50	3
5	XX-XXX-XXXX	Elective – I (G-T/D- T) *	3			50	50	3
6	25-493-02XX	Elective – II (D-T)	3			50	50	3
7	25-493-0207	Software Lab II (Android & Cloud) (LAB)			4	50	50	2
8	25-493-0208	Internship – Android/Web App Development	40 Working days			50	50	8
		Total				**400**	**400**	**30**

* Any general interdisciplinary subject may be considered for XX-XXX- XXXX apart from the list of electives given

XX– is the unique two-digit number of the particular elective course from the list of elective courses

THIRD SEMESTER

Slno	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internal	End Semester	
1	25-493-0301	Entrepreneurship and New Venture Planning (G-T)	3			50	50	3
2	25-493-0302	Agile Process Management. (G-T)	3			50	50	3
3	25-493-0303	Programming with Swift (D-P)	3		2	50	50	4
4	25-493-0304	iOS App Development-SwiftUI Framework (D-P)	3		2	50	50	4
5	25-493-0305	Applied Technologies in iOS (D-P)	3		2	50	50	4
6	25-493-03XX	Elective – III	3			50	50	3
7	25-493-03XX	Elective – IV	3			50	50	3
8	25-493-0308	Software Lab III (iOS & Swift) (LAB)			6	50	50	3
9	25-493-0309	Professional Skills Development (Training Programme) (G-T)	2		2	100		3
		Total				**500**	**400**	**30**

***** Any Cross Platform Technology may be considered for Elective – III (G- T/D-T)

XX– is the unique two-digit number of the particular elective course from the list of elective courses

FOURTH SEMESTER

Slno	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internal	End Semester	
1	25-493-0401	* Main Internship (90 working days during Semester IV in an IT firm where students contribute to a live iOS/Android/Cross-platform/Web application development) and Viva voce (Continuous Assessment – 100 marks, Final report – 100 marks &Viva-Voce – 100 marks)				100	200	28
2	25-493-0402	MOOC courses from the list of courses shortlisted from the list of NPTEL/SWAYAM courses (or MOOC COURSES recognized by UGC), or CUSAT MOOC portal and approved by the academic committee, with a duration of not less than eight weeks					100	2
		Total				**100**	**300**	**30**

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

*The objective of Major Project is to provide students with practical exposure to the world of Software Application Development whereby they get an opportunity to apply the knowledge and skill acquired throughout the course. The students are required to undertake the internship training with an organization. The project should be live (under development) or modification of existing work and should be based on Software Application Development (Web, Android, iOS) and related technologies. The project will be for 90 working days. Each student will be allotted to a faculty guide for the internship.

MOOC Courses: The online courses that fully satisfy the guidelines of the Regulations for Conducting Online Courses (MOOC) of CUSAT.

LIST OF ELECTIVES (DT)

CODE for the particular Elective Course: 25-493-0AXX

'A' stands for semester number in which it is offered.

'XX' stands for unique two-digit number for a particular elective course.

- 25-493-0AXX Wearable Technologies in Android.
- 25-493-0AXX Watch OS Programming
- 25-493-0AXX Cross Platform Development using React Native
- 25-493-0AXX iOS App Development Fundamentals using Storyboard Framework
- 25-493-0AXX Flutter for Beginners
- 25-493-0AXX Java Middleware using Spring Boot
- 25-493-0AXX Game Development using Unity and C#
- 25-493-0AXX Programming with Python
- 25-493-0AXX Internet of Things (IoT)
- 25-493-0AXX Machine Learning for Software application Development.
- 25-493-0AXX Introduction to Android Auto
- 25-493-0AXX Augmented Reality for iOS App Development Using ARkit
- 25-493-0AXX Cyber Security

MODE OF EVALUATION

Mode of Evaluation will be fully internal with a total of 100 marks for all courses except for Main Internship in semester IV. The evaluations are classified as follows: -

1) **Domain Theory and General Theory (Group I),** subjects will be evaluated using 50 marks for continuous assessment throughout the semester and 50 marks are for End- semester examination (theory based).

2) **Domain Practical and General Practical (Group II),** subjects will be evaluated using 50 marks for continuous assessment and 50 marks for End-semester examinations. The end-semester exam will be conducted as 25 marks for theory and 25 marks for practical exam.

3) **The Lab exams (Group III)** will be evaluated using 50 marks for continuous assessment throughout the semester and 50 marks for practical exams.

4) For **25-493-0309 - Professional Skills Development (Training Programme)** (**Group IV**), for this subject in Semester III, the entire 100 marks will be awarded through continuous assessment by the teachers through case analysis, group discussion, team building tasks, leadership role, problem solving exercises, personal improvement, report writing, presentations etc.

5) For **25-493-0208 Internship – Android/Web App Development in semester II (Group V)**, out of a total of 100 marks, 50 marks are for continuous assessment including evaluation of written report and remaining 50 marks will be awarded through a viva voce examination conducted by a board of not less than two internal examiners.

6) For **25-493-0401 Main Internship in Semester IV (Group V)**, the maximum marks shall be 300, of which 100 marks each will be allotted on the basis of:
   - Continuous evaluation of the project work
   - Submission and evaluation of the project report at the department
   - Viva–voce examination carried out by a board of examiners.

7) For **25-493-0402 MOOC Course (Group VI),** the student may enroll in any one of the approved MOOC from the list of courses shortlisted by DDUKK Centre Council from the list of NPTEL/SWAYAM courses (or MOOC COURSES recognized by UGC), or CUSAT MOOC portal and approved by the academic committee, with a duration of not less than eight weeks, during the period of M.Voc (SAD) programme. In any case the MOOC course should be completed before the end of fourth semester. The course credits for MOOC course will be two credits and the same will be awarded after completion of assessment as prescribed by the Centre Council in the fourth semester.

Assessment pattern for End-Semester Examinations

1. Courses Under Group I

No	Subject Code	Name of the subject
1	25-493-0101	Communication Skills Development (G-T)
2	25-493-0102	Fundamentals of Management (G-T)
3	25-493- 0201	Project Management (G-T)

4	25-493-0301	Entrepreneurship and New Venture Planning (G-T)
5	25-493-0302	Agile Process Management. (G-T)
6	25-493-0104	Product Engineering (D-T)
7	In addition to those listed above, all elective courses come under Group I	

Assessment scheme for courses under Group I

Assessed Cognitive Ability	Weightage as Percentage of Total Marks
Remember / Understand	20 %
Apply / Analyze	40 %
Evaluate / Create	40%

The question paper for the End-Semester examination shall be set by the concerned teacher in advance which shall be scrutinized by the respective Centre/Department Council or by a committee consisting of the HOD and faculty members or subject experts offering the courses in that semester to ensure that:

- Questions are within the scope of the syllabus.
- Entire syllabus of the course is fairly covered in the question papers.
- The question paper adheres to the assessment methodology for the course.

Modifications can be suggested by the council if necessary and such suggestions shall be incorporated in the final version of the question paper.

The End-Semester (DT/GT) question paper shall have three parts namely Part-A, Part-B and Part C. The maximum marks for End-Semester Examinations will be 50.

- In Part A, there will be 5 compulsory questions which will be of short answer type. Each question in Part A carries two marks.
- In Part-B, will consist of six questions out of which students must answer four questions. Each question will carry five marks in this part.
- In Part-C, students will answer two questions of 10 marks each from a group of three questions.

2. Courses Under Group II

No	Subject Code	Name of the subject
1	25-493-0103	Object Oriented Programming and Web Technologies (G-P)
2	25-493-0105	Algorithm and Data Structures (D-P)
3	25-493-0106	Database and Backend Technologies (D-P)
4	25-493-0107	Full stack Development (MERN Stack) (D-P)
5	25-493-0202	Android App Development - Kotlin & XML (D-P)
6	25-493-0203	Android App Development - JetPack Compose (D-P)
7	25-493-0204	Cloud and Advanced Technologies (D-P)
8	25-493-0303	Programming with Swift (D-P)
9	25-493-0304	iOS App Development-SwiftUI Framework (D-P)
10	25-493-0305	Applied Technologies in iOS (D-P)

Assessment scheme for courses under Group II

Assessed Cognitive Ability	Weightage as Percentage of Total Marks
Remember / Understand	20 %
Apply / Analyze	40 %
Evaluate / Create	40%

***** The weightage will be evenly split between theory and practical parts.

The maximum marks for End-Semester Examinations will be 50 which is evenly divided between the two parts. The End-Semester (DP/GP) question paper will be divided into two parts, namely Part-I (theory), and Part-II (practical).

- The Part-I carries 25 marks and has two Sections namely Section-A and Section-B.

    - Section A will have 4 questions each of 5 marks, out of which 3 needs to be answered.
    - The Section-B has 2 questions of 10 marks each out of which 1 question needs to be answered.
- Part-II, in practical mode, will have three questions of 25 marks each out of which 1 question needs to be answered.
- Both Part I and Part II will be of 90 minutes duration.

3. Courses Under Group III

No	Subject Code	Name of the subject
1	25-493-0108	Software Lab I (Web, Kotlin, Git &SQL) (LAB)
2	25-493-0207	Software Lab II (Android & Cloud) (LAB)
3	25-493-0308	Software Lab III (iOS & Swift) (LAB)

Assessment scheme for courses under Group III

Assessed Cognitive Ability	Weightage as Percentage of Total Marks
Remember / Understand	20 % (Problem Definition)
Apply / Analyze	40 % (Problem Implementation)
Evaluate / Create	40 % (Execution)

The End-Semester lab exam will be of 50 marks. The number of questions can be varied according to the nature of the subject and the distribution of marks for each question will be decided by the examiners concerned based on the norms set by the Centre/Department council. The Understand / Remember part of the assessment can be done by two methods:

- through viva-voce conducted during the examination
- through evaluating how the student conceives the problem using various methods such as Flowcharts, Figma Wireframes, Algorithms, etc.

4. Courses Under Group IV

No	Subject Code	Name of the subject
1	25-493-0309	Professional Skills Development (Training Programme) (G-T)

Assessment scheme for courses under Group IV

Assessed Cognitive Ability	Weightage as Percentage of Total Marks
Remember / Understand	20 %
Apply / Analyse	40 %
Evaluate / Create	40%

5. Courses Under Group V

No	Subject Code	Name of the subject
1	25-493-0208	Internship – Android/Web App Development
2	25-493-0401	Main Internship -iOS/Android/Cross-platform/Web application development

Assessment Scheme for courses under Group V

Assessed Cognitive Ability	Weightage as a Percentage of Total Marks
Remember	5 %
Understand	10 %
Apply	15 %
Analyze	20 %

Evaluate	20 %
Create	30 %

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 a minimum following technical component:

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

Viva Voce: Viva voce will be conducted by a board of examiners of not less than three members.

6. Courses Under Group VI

No	Subject Code	Name of the subject
1	25-493-0402	MOOC Course

Assessment Scheme for courses under Group VI

A faculty member shall be nominated by the Director/Centre Council as coordinator for the MOOC courses to guide, monitor and coordinate the student enrolment, internal and external assessments if any are required, for the timely completion of the programme before the end of the fourth semester. Based on the requirement of expertise, the Director/Centre Council can nominate one or more faculties to coordinate and guide the MOOC courses and the related assessments.

The student will have to submit proof of completion of the selected course as well as assessment results for the MOOC course by the offering institution to the MOOC Course Coordinator. In case the offered course does not have a separate examination for final assessment, the faculty guide/coordinator of the MOOC Course, as approved by the Director / Department Council, shall coordinate the conduct of an assessment for the course selected by the student and arrange for the award of marks.

Those students who are interested to be evaluated by the host institution may be permitted for it also. The credit so obtained can be used for finalizing the semester results. This has to be done by obtaining permission from the HoD/Department Council well in advance.

The faculty coordinator of the MOOC course has to place the marks obtained by the students in continuous evaluation and for the end semester examination/or the score received from the host institution in the passing board of the department.

FIRST SEMESTER

Slno	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internal	End Semester	
1	25-493-0101	Communication Skills Development (G-T)	3			50	50	3
2	25-493-0102	Fundamentals of Management (G-T)	3			50	50	3
3	25-493-0103	Object Oriented Programming and Web Technologies (G-P)	3		2	50	50	4
4	25-493-0104	Product Engineering (D-T)	4			50	50	4
5	25-493-0105	Algorithm and Data Structures (D-P)	2	1	2	50	50	4
6	25-493-0106	Database and Backend Technologies (D-P)	2	1	2	50	50	4
7	25-493-0107	Full stack Development (MERN Stack) (D-P)	2	1	2	50	50	4
8	25-493-0108	Software Lab I (Web, Kotlin, Git & SQL) (LAB)			8	50	50	4
		Total				**400**	**400**	**30**

25-493-0101 COMMUNICATION SKILLS DEVELOPMENT

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand business communication theory in the context of workplace	Understand
CO2	Apply business communication theory to solve workplace communication issues	Apply
CO3	Communicate effectively with colleagues in meetings and use new media/tools for effective communication	Apply
CO4	Prepare business letters, tenders, quotations, agenda, minutes, memo, resumes, and job application cover letters	Create
CO5	Prepare and present effective PowerPoint presentation	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		2			1	2	3	
CO2		2			1	2	3	3
CO3					1		3	3
CO4							3	3
CO5							3	3

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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2. *Meenakshi Raman and Sangeeta Sharma,* Technical Communication: Principles and Practice*, 2nd Edition, Oxford University Press, 2011, ISBN-13:978-0198065296*
3. *Chaturvedi P.D and MukeshChaturvedi,* The Art and Science of Business Communication*, 4e, Pearson, 2017, ISBN-13:978-9332587281*
4. *Sanjay Kumar and PushpLata,* Communication Skills*, Oxford University Press, 2011, ISBN-13:978-0198069324*
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25-493-0102 FUNDAMENTALS OF MANAGEMENT

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the role of managers in organizations	Understand
CO2	Understand employee motivation, and its determinants	Understand
CO3	Understand organization structure and organizing	Understand
CO4	Analyse individual and group behavior in organizational context	Analyse
CO5	Evaluate the appropriateness of different leadership styles	Evaluate

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1					1	2	2	1
CO2					1		1	1
CO3					1	2	2	2
CO4						3	3	3
CO5						3	3	3

Module I

Introduction to Organizational management, nature and complexity - Managerial Skills, Schools of management thought, Organizational 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 organizations.

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 Behavior. 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 Behavior - Sources of Managerial Stress – managing stress. Conflicts in organization and management.

REFERENCES

1. *Stoner J. A., Freeman A. E., and Gilbert D. A. G.,* Management*, 6th Edn, Prentice-Hall of India, 2002, ISBN-13:9788131707043*
2. *Koontz H., and Weihrich H.,* Essential of management: An international perspective*, New Delhi: Tata McGraw-Hill publishing Co. Ltd, 2008, ISBN-13:9780071067676.*
3. *Robbins S. P., and Coulter M.,* Management*. Prentice Hall of India Private Limited, 2014, ISBN-13: 9780131439948.*
4. *Robbins, S. P., and Judge, T.,* Essentials of organizational behaviour*, Pearson, 2012, ISBN-13: 9780132545303.*

5. *Stephen P. Robbins, Mary Coulter &Neharika Vohra,* Management *10e, Pearson Education Inc.(Prentice Hall), 2011, ISBN-13: 978-0132090711.*
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25-493-0103 OBJECT ORIENTED PROGRAMMING AND WEB TECHNOLOGIES

COURSE DESCRIPTION

The course equips the students to understand the fundamentals and advanced concepts in Object-Oriented Programming. It also introduces web technologies like HTML, XML, protocols used, protocol architectures, web architectures, JSON, HTML5, Socket programming, and its implementations. It enables the students to write programs using Kotlin and Object-Oriented concepts. The web technology's part allows us to understand how internet and HTTP works. It gives the students an understanding of how WebSocket's works.

COURSE OUTCOMES

CO	Learning Outcomes	Cognitive Level
CO1	Understand the basics of OO Programming	Understand
CO2	Understand Web and Internet architectures	Understand
CO3	Apply intermediate OOP concepts and write programs based on it.	Apply
CO4	Apply advanced OOP concepts to build programs and execute it.	Apply
CO5	Design/Create basic to advanced java programmes	Create

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

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1						
CO2	1	3			3			2
CO3	2	2		2	1			
CO4	2	3		3	1			
CO5	3	1		2	1			

Module 1

What is Object-Oriented Programming?, Characteristics of Object-Oriented Programming, Advantages of Object-Oriented Programming, Introduction to Kotlin, Basic syntax of Kotlin, Variables and Data Types in Kotlin, Operators in Kotlin, Control structures in Kotlin, Functions in Kotlin, Classes and Objects in Kotlin. Constructors. Argument Passing. Recursive Methods. Static. Nesting. Returning data and objects.

Module 2

Encapsulation: Private Properties. Getters and Setters. Access Modifiers. Inheritance: Superclasses and Subclasses, Overriding Methods, Abstract Classes and Interfaces. Polymorphism: Method Overloading, Method Overriding, Late Initialization. Object-Oriented Design Principles: Single Responsibility Principle, Open-Closed Principle, Liskov Substitution Principle, Interface Segregation Principle, Dependency Inversion Principle. Exception Handling.

Module 3

Generics in Kotlin. Higher-Order Functions. Lambdas in Kotlin. Collections in Kotlin. Coroutines in Kotlin. Object-Oriented Design Patterns: Singleton Pattern, Factory Pattern, Observer Pattern, Decorator Pattern. Streams. File Handling.

Module 4

Introduction to Web: In Perspective, Origin. Before the web: TCP/IP. Birth of WWW: HTTP. Web Servers, Web Browsers. HTML & its Roots, XML & Applications, JSON. Architectural Patterns-Architectural Design Tenets. Thin Client-Fat Client.

Module 5

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. Web Socket

REFERENCES

1. *Skeen, J., & Greenhalgh, D. (2017). Kotlin Programming: The Big Nerd Ranch Guide. Big Nerd Ranch Guides.*
2. *Jemerov, D., & Isakova, S. (2017). Kotlin in Action. Manning Publications. ISBN-10: 1617293296*
3. *Griffiths, D., & Griffiths, D. (2019). Head First Kotlin. O'Reilly Media. ISBN-10: 1491996692*
4. *Leiva, A. (2017). Kotlin for Android Developers. Leanpub. ISBN-10: 1549612153*
5. *Ebel, N. (2017). Mastering Kotlin: Learn advanced Kotlin programming techniques to build apps for Android, iOS, and the web. Packt Publishing. ISBN-10: 1788470715*
6. *Udemy. (n.d.). Object-Oriented Programming in Kotlin. [Video Course]. Retrieved from https://www.udemy.com/course/object-oriented-programming-in-kotlin/*
7. *Udacity. (n.d.). Kotlin for Android Developers. [Video Course]. Retrieved from https://www.udacity.com/course/kotlin-for-android-developers--ud888*
8. *JetBrains. (n.d.). Official Kotlin documentation. Retrieved from https://kotlinlang.org/docs/home.html*

25-493-0104 PRODUCT ENGINEERING

COURSE DESCRIPTION

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

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the ethics in software development, the software architecture relevant to software development.	Understand
CO2	Analyse responsive user interface design, design based on locale and different UI design methodologies.	Analyse
CO3	Design and create wireframe and prototype using figma.	Create
CO4	Analyse the types of testing used in different development scenarios.	Analyse
CO5	Create test cases for a suitable iOS/Android/Web application.	Create

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1		**3**	**1**	**2**			**2**	
CO2	**1**	**1**	**2**	**2**	**3**			**3**
CO3	**2**	**2**	**3**	**3**	**3**			**3**
CO4			**2**	**3**	**2**			**2**
CO5			**2**	**3**	**3**			**2**

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, Coding Standards, Software Testing and Evolution.

Module 2

Usability and user interface design – Design considerations for mobile and touch devices – UI components-UI Design Patterns and Anti Patterns- Material Design: The basics: material design, Apple Design System,Material Web,views, layouts, resources, Designing User interface components:

Widgets, Typography, Icons, and Transitions.

Module 3

The Full Design: prototyping, visuals, design, animation. Mobile Wireframing: Representing inputs, gestures and motion, Mobile Prototyping using Figma – Introduction to Prototyping, creating components using Figma, After Delay Animation, Animated Button Prototype, Tab Bar Animation, Scrolling Content and Sticky Elements, Video Prototype, Drag Gestures, Menu, Plugins

Module 4

Software Testing - Types of application Testing – Usability, Compatibility, interface, services, low-level resource, performance, operational, installation & security, User Testing: Concepts, different types of user testing, User Testing vs. Usability testing.

Module 5

Practical Tasks- Selection of a suitable android/iOS app/Web 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. *PrajyotMainkar,* 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. *Greg Nudelman,* Android Design Patterns: Interaction Design Solutions for Developers*, Wiley; 1 Kindle Edition, 2013, ISBN-13:978-1118394151*
8. *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*

25-493-0105 ALGORITHM AND DATA STRUCTURES

COURSE DESCRIPTION

Acquire some basic mathematical tools and techniques for algorithm analysis. To familiarize themselves with basic data structures and to develop the ability to choose the appropriate data structure for designing efficient algorithms. Learn some basic algorithms with their rigorous proofs of correctness and efficiency analysis of implementation using appropriate data structures.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	To know about some basic data structures, their implementation and some of their standard applications.	Understand
CO2	To develop the ability to analyze the running time and prove the correctness of basic algorithms.	Analyse
CO3	Define advanced data structures such as balanced search trees, hash tables, spatial data structures and create the different data structures to solve a problem.	Create
CO4	Describe and compare the performance of various sorting algorithms like quicksort, mergesort and heapsort and describe algorithms on trees and graphs such as traversals, shortest path and minimum spanning tree.	Analyse
CO5	To develop the ability to design and analyze simple algorithms using the appropriate data structure learned in the course.	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1		3	2				
CO2			2	2		3		
CO3			2	3				
CO4			2	3				
CO5			2	3				

Module 1

Data Structures and Algorithms, Measuring Running time of Algorithms, Asymptotic Analysis, Big O Notation, Finding Big O, Tight and Loose Upper Bounds, Big O analysis of Algorithms, Finding Time Complexity, Big O analysis of Algorithms: Examples, Worst case, Best case and Average Case Analysis, Common Complexities, Abstract Data Types.

Module 2: Sorting and Searching

Introduction to Sorting Algorithms, Sort Stability, Selection Sort, Analysis of Selection Sort, Bubble Sort, Improvement in Bubble Sort, Analysis of Bubble Sort, Insertion Sort, Analysis of Insertion sort, Shell Sort, Analysis of Shell Sort, Merging, Recursive Merge Sort, Analysis of Merge Sort, Iterative Merge Sort, Quick Sort, Analysis of Quick Sort, Heap Sort, Heap Sort : Radix Sort, Radix Sort Linear Search, Linear Search in Sorted List, Binary Search, Implementation of Binary Search, Analysis of Binary Search

Module 3

Stacks, The Stack Abstract Data Type , Simple Array-Based Stack Implementation ,Reversing Data Using a Stack , Matching Parentheses and HTML Tags ,Queues, The Queue Abstract Data Type , Array-Based Queue Implementation, Double-Ended Queues , The Deque Abstract Data Type, Implementing a Deque with a Circular Array

Module 4: Linked List

Introduction to Linked List, Traversing and Searching a Single Linked List, Finding references in a single linked list, Insertion in a Single Linked List, Deletion in a Single Linked List, Reversing a Singly Linked List, Sorting a Linked list using Bubble Sort, Merging of sorted Linked lists, Sorting a Linked list using Merge Sort, Finding and Removing a cycle in a Linked list, Doubly linked list, Insertion in a doubly linked List, Deletion from doubly linked list, Reversing a doubly linked list, Circular linked list, Insertion in a circular Linked List, Deletion in a circular linked list, Concatenation, Linked List with Header Node, Sorted linked list.

Module 5: Trees

Introduction to trees, Binary Tree, Strictly Binary Tree and Extended Binary Tree, Full binary tree and Complete Binary Tree, Array Representation of Binary trees, Linked Representation of Binary Trees,Traversal in Binary Tree, Preorder Traversal, Inorder Traversal, Postorder Traversal, Level order traversal, Finding height of a Binary tree, Constructing Binary tree from Traversals, Constructing binary tree from inorder and preorder traversals, Constructing binary tree from inorder and postorder traversals Binary Search Tree- Introduction, Traversal in Binary Search Tree, Searching in a Binary Search Tree, Nodes with Minimum and Maximum key, Insertion in a Binary Search Tree, Deletion in a Binary Search Tree

REFERENCES

1. *Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein. Introduction to Algorithms, Third Edition, PHI Learning, 2009. ISBN:978-81-203-4007-7.*
2. *Sanjoy DasGupta, C. H. Papadimitriou, Umesh Vazirani. Algorithms, First Edition, Tata McGraw Hill, 2006. ISBN: 978-0073523408.*
3. *Aaron M. Tanenbaum, Moshe J. Augenstein, Yedidyah Langsam, Data Structures using Java, Pearson Education, 2003, ISBN 13: 9780130477217.*
4. *Ellis Horowitz, SartajSahni, Dinesh P. Mehta, Fundamentals of Data Structures in C++, Silicon Press, 2007.*
5. *Jean Paul Tremblay and Paul G Sorenson, An introduction to Data Structures with Applications,McGraw-Hill, Singapore, 1984*

25-493-0106 DATABASE AND BACKEND TECHNOLOGIES

COURSE DESCRIPTION

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. The Realm helps to write efficient NoSQL databases and the GraphQL enables the students to write backend API effectively.

COURSE OUTCOMES

CO	Learning Outcomes	Cognitive Level
CO1	Understand the basic building blocks of DBMS.	Understand
CO2	Understand the structure of GraphQL and its applications.	Understand
CO3	Understand Realm constructs and its application.	Understand
CO4	Apply intermediate DBMS concepts to retrieve data.	Apply
CO5	Design advanced table structures and retrieve data from it.	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2		1				
CO2	1	2	3	3	1			1
CO3	1	2	3	3	1			1
CO4	1			1				
CO5	2	3		1				

Module 1

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 2

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. Multi-table Relational Database: Design, Indexes, Integrity, Normalization.

Module 3

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, Advanced Topics: Cursors, Procedures, Triggers, Exception Handling, Functions, Views.

Module 4

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

Module 5

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. Searching and Filtering RealmObjects – Supported Types, Realm Instances & Objects, Realm Configurations, Annotations „@", Realm Controllers, Realm Adapters, Realm Transactions.

REFERENCES

1. *DejanSarka, SQL Server 2016 Developer's Guide, Packt Publishing Limited , 2017, ISBN-13:978-1786465344*
2. *Cyrus Dasadia , AmolNayak , MongoDB Cookbook , Packt Publishing , 2016, ISBN-13: 978-1785289989*
3. *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*
4. *Gerardus Blokdyk - Realm (database) Third Edition, 5STARCooks, 2018, ASIN: B07CVSL2KW*
5. *Alex Banks (Author), Eve Porcello - Learning GraphQL: Declarative Data Fetching for Modern Web Apps, Shroff/O'Reilly, 2018, ISBN-10 : 9352137582.*

25-493-0107 FULL STACK DEVELOPMENT

COURSE DESCRIPTION

This course provides a beginner-level overview of web design and development and hands-on experience with the in-demand skills, frameworks, and languages of today. This course covers the front-end development of web applications using html, CSS, JavaScript, and React.js. Providing a course in this area can bolster the employability of the students at industry giants and also help them find success through self-employability.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Become familiarized with the overall domain of Web development framework and technologies.	Understand
CO2	Write, debug and maintain well-structured HTML code along with CSS styling.	Create
CO3	Implement javascript frameworks such as reactjs and nodejs.	Create
CO4	Create an interactive front end using javascript.	Create
CO5	Develop a fully functioning website and deploy on a web server.	Create

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	**3**	**3**				**1**		**1**
CO2	**1**	**2**	**3**	**3**				
CO3	**3**		**2**	**2**	**3**			
CO4	**2**		**3**	**2**	**3**			
CO5	**3**			**2**	**3**			**2**

Module 1

Process and Design : How to approach building a site, Understanding your audience and their needs, How to present information visitors want to see.

Design and build Websites: Introduction to HTML, HTML Essentials, HTML: Structure, Shadow DOM, Text, Lists, Links, Images, Tables, Forms, Extra Markup, Video and Audio. Introducing CSS, Color, Text, Boxes, Lists, Tables and Forms, Layout, Images, HTML5 layout elements, how old browsers understand new elements, Styling HTML5 layout elements with CSS

Module 2

Interactive front end web development: Introduction to TypeScript, ArrayFunctions, ES6, Creating TypeScript development environment, Basic JavaScript Instructions, Functions, Methods and

Objects, Decisions and Loops, Intermediate JavaScript solutions and the DOM (Document Object Model) manipulation, JQuery, Ajax and JSON, APIs.

Module 3

Introduction to ReactJs, React Components and libraries, React states and events, React rendering and conditional content, Forms and functional front end web applications using React, React hooks: Introducing Hooks, useState, useEffect, useContext, useRef, useReducer,useCallback, useMemo, Custom Hooks.

Module 4

Introduction to Nodejs with TypeScript, Installing, setting up node development environment, NPM,NVM and modules, File System, Events and debugging, Creating web servers: Controller, Service, Model/DAL, Middleware functions, HTTP Methods, Router params. Database connectivity: DB Driver: mongoose, mongodb.

Module 5

Docker compose: image repository, Docker Hub, Load Balancing: PM2, Start, Log Stream, Environment Variables, Graceful Exit. Connection Pool. Token: JWT, Access, Refresh. Auth2.0. FCM Notification: Overview of Firebase Cloud Messaging, Differences between FCM and other messaging solutions, Setting up FCM. Using the Firebase console to send notifications, Sending notifications using the REST API, Understanding notification payloads and options, Testing notifications.

REFERENCES

1. *"Web Design with HTML, CSS, JavaScript and Jquery Set" by Jon Duckett. Wiley, ISBN 978-1118907443.*
2. *"Express.js: Node.js Framework for Web Application Development" by Daniel Green. Apress, ISBN 978-1484200336.*
3. *"Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB" by Azat Mardan. CreateSpace Independent Publishing Platform, ISBN 978-1501098424.*
4. *"Full Stack Web Development For Beginners: Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP" by Riaz Ahmed. Independently published, ISBN 979-8693245594.*
5. *"TypeScript Handbook" by Microsoft. Microsoft Corporation, ISBN 978-1-5093-0698-8.*
6. *"Programming TypeScript" by Boris Cherny. O'Reilly Media, Inc., ISBN 978-1-492-06648-8.*
7. *"Effective TypeScript" by Dan Vanderkam. O'Reilly Media, Inc., ISBN 978-1-492-07361-5.*
8. *"TypeScript Deep Dive" by Basarat Ali Syed. Leanpub, ISBN 978-0-991-79714-8.*
9. *"TypeScript Essentials" by Christopher Nance. Packt Publishing, ISBN 978-1-78328-998-5.*

25-493-0108 SOFTWARE LAB I (WEB, KOTLIN, GIT & SQL)

COURSE DESCRIPTION

This course employs the concepts taught in the first semester for developmental purposes. JAVA, SQL, and Web 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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CLO1	Create advanced applications based on Java	Create
CLO2	Create advanced databases based on SQL and SQLite	Create
CLO3	Design and create projects based on Web architectures	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1			1	2				
CO2			3	3				2
CO3				3	3			3

Module I

Git Basics : Familairzing with version control and Git Flow

a. Version Control
b. Setting up Git
c. Creating Repository
d. Git Branching
e. Git Commiting
f. Git Merging
g. Git Pushing
h. Git Pulling
i. Collaborating with Git

Module II

SQL Basics: Programs to familiarize with the following concepts.

a. DDL and DML Queries.
b. Grouping and Aggregating.
c. SQL Joins.
d. Inner Queries and Multilevel Queries.

e. MongoDB: CRUD.
f. Aggregation: Group By, Order By.
g. Realm

Module III

Web Basics: Programs to familiarize with the following concepts.

h. Figma Wireframes
i. HTML.
j. Layouts and Positioning.
k. TypeScript.
l. React.
m. NodeJs.

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-139780596521189.*
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.*

SECOND SEMESTER

Slno	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internal	End Semester	
1	25-493-0201	Project Management (G-T)	3			50	50	3
2	25-493-0202	Android App Development - Kotlin & XML (D-P)	3		2	50	50	4
3	25-493-0203	Android App Development - JetPack Compose (D-P)	3		2	50	50	4
4	25-493-0204	Cloud and Advanced Technologies (D-P)	1		4	50	50	3
5	XX-XXX-XXXX	Elective – I (G-T/D- T) *	3			50	50	3
6	25-493-02XX	Elective – II (D-T)	3			50	50	3
7	25-493-0207	Software Lab II (Android & Cloud) (LAB)			4	50	50	2
8	25-493-0208	Internship – Android/Web App Development	40 Working days			50	50	8
		Total				**400**	**400**	**30**

25-493-0201: PROJECT MANAGEMENT

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Understand the concepts of project definition and life cycle	Understand
CO2	Demonstrate understanding of project scooping, work definition, and work breakdown structure (WBS)	Understand
CO3	Understand the use of computers in project management	Understand
CO4	Analyse the complex tasks of time estimation and project scheduling, including PERT and CPM	Analyse

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1				1		2		
CO2				2	2	3		
CO3				2	2	3		
CO4						3		

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 Software's.

REFERENCES

1. *Bentley,* The Essence of the Project Management Method*, 7th Edition. CAIS Management, 2011, ISBN-139780954663568*
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*

25-493-0202 Android App Development - Kotlin & XML (D-P)

COURSE DESCRIPTION

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

COURSE OUTCOMES

CO	Learning Outcomes	Cognitive Level
CO1	Understand the basic working principle of Android App Development.	Understand
CO2	Apply Compose to build efficient UI	Apply
CO3	Apply Intermediate Android framework components to create applications.	Apply
CO4	Analyze various asynchronous programming constructs and its applications.	Analyze
CO5	Create basic to intermediate android applications.	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1		2			1
CO2	1	2	3	3	2			
CO3	3		2					
CO4	2		3	3		3		
CO5	3		1		1			1

Module I

Android Studio. Introduction to Building Tools: Kotlin, JDK, JRE, Android SDK, Android Developer Tools. Setting up Android Environment and Emulator. Android Architecture: Overview of the Stack, Linux Kernel, Native Libraries, Dalvik Virtual Machine, Android Virtual Machine (ADT), Dalvik Debug Monitor Server (DDMS), LogCat, Application Licensing, Gradle.

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

Module II

Intermediate Development I: Notifications, Toast, Custom Toast, Dialogs, Status bar Notifications. Multithreading: Using Kotlin coroutines: Launch, Async, Dispatchers. Styles and Themes: Creating and applying simple Style, inheriting built-in Style and User-defined style, Using Styles as themes. Resources and Assets: Android Resources, Using resources in XML and code, Localization, Handling Runtime configuration changes.

Module III

Intermediate Development II: Fragment Lifecycle, Fragment Example, Dynamic Fragment. Adaptor: Array Adaptor, ArrayList Adaptor, Base Adaptor. View: Grid View, Web View, Scroll View. Creating UI through Kotlin and Compose (XML), Communicating data among Activities and Fragments.

Module IV

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

Module V

Services: Overview of services in Android, implementing a Service, Service lifecycle, Android Service API. WorkerManager vs Services. Multimedia in Android: Multimedia Supported audio formats, Simple media playback, Supported video formats, and Simple video playback. Location-Based Services and Google Maps.

REFERENCES

1. *Wallace Jackson, Android Apps for Absolute Beginners, Apress, 2012. ISBN-13:978-1430247883.*
2. *John Horton - Android Programming with Kotlin for Beginners: Build Android apps starting from zero programming experience with the new Kotlin programming language, Packt Publishing Limited, 2019, ISBN-10 : 1789615402.*
3. *Dmitry Jemerov , Svetlana Isakova - Kotlin in Action, Manning; 1st edition, 2017, ISBN-10 : 1617293296.*
4. *Dawn Griffiths - Head First Kotlin: A Brain-Friendly Guide, O'Reilly Media, 2019, ASIN : B07NPZ21QP.*
5. *Josh Skeen, David Greenhalgh - Kotlin Programming: The Big Nerd Ranch Guide, Big Nerd Ranch Guides; 1st edition, 2018, ISBN-10 : 0135161630.*
6. *Neil Smyth - Jetpack Compose 1.2 Essentials: Developing Android Apps with Jetpack Compose 1.2, Android Studio, and Kotlin, Payload Media, 2022, ISBN-10 : 1951442504.*
7. *Thomas Kunneth - Android UI Development with Jetpack Compose: Bring declarative and native UIs to life quickly and easily on Android using Jetpack Compose, Packt Publishing, 2022, ISBN-10 : 1801812160.*

25-493-0203 Android App Development - JetPack Compose (D-P)

COURSE DESCRIPTION

This course evaluates the advanced features of Android application development. The students get familiar with JetPack Compose. The students understand predominant Android architectures such as MVC, MVVM, MVP. Advanced backend features such as API integration using Retrifit/Volley and Room persistence is explored. Unit testing is integrated with the framework so that students get overall development experience.

COURSE OUTCOMES

CO	Learning Outcomes	Cognitive Level
CO1	Understand Room DB and Content Providers.	Understand
CO2	Apply Services in App Development.	Apply
CO3	Design and create applications using predominant android architectures.	Create
CO4	Create Map based applications.	Create
CO5	Create applications consuming API's	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	3					1
CO2	3	1	3	2				
CO3	3	2	3					
CO4	2		2	2	2			1
CO5	2		2					

Module 1

Recap: Difference between compose and xml. Compose componts: Image ,Button, Text, Text Filed. Layouts: Row, Column, Box, Scaffold. List: Lazylist, LazyColunm, LazyRow. State Management, Jetpack Compose Navigation, Compose Interoperability with XML.

Module II

Android design architectures: MVC: - Model, View, Controller. MVP: - Model, View, Presenter. MVVM: - Model, View, View, Controller. Comparison of architectures, Advantages and disadvantages of modern design architectures, Writing scalable code. Classes: Sealed Class, Data Class, Enum Classes, Inline Class. JetPack LiveData.

Module III

Database Integration: Introducing SQLite, SQLite vs RoomDB, Creating a database using RoomDB and performing CRUD (Create, Read, Update and Delete) operations, Content Providers & Services: Content Providers. Dependency Injection using Google Dagger Hilt.

Module IV

Web Services and WebView: Consuming web services using Retrofit/Volley, Receiving HTTP Responses (XML, JSON), Parsing JSON and XML using Gson. Worker Manager: Creating,

scheduling, Work Continuation, ListenableWorker, Dependency Injection and optimization. Using WebView, Sensors: How Sensors work, Sensor API. Best practices for performance.

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. Future of Android.Telephony Services: Making calls, accessing phone properties and status, sending messages, Sending Emails. Unit Testing: Junit, Mockito, Espresso. Wi-Fi: Monitoring and managing Internet connectivity.

REFERENCES

1. *Neil Smyth - Android Studio 3.0 Development Essentials: Android 8 Edition, Amazon Digital Services; 1st edition, 2017, ISBN-10 : 1977540090.*
2. *Ian Darwin - Android Cookbook: Problems and Solutions for Android Developers, Second Edition, Shroff/O'Reilly; Second edition, 2017, ISBN-10 : 9352135555.*
3. *Alex Forrester, Eran Boudjnah, Alexandru Dumbravan, Jomar Tigcal - How to Build Android Apps with Kotlin: A hands-on guide to developing, testing, and publishing your first apps with Android, Packt Publishing Limited, 2021, ISBN-10 : 1838984119.*
4. *Mark Wickham - Practical Android: 14 Complete Projects on Advanced Techniques and Approaches, Apress; 1st ed. Edition, 2018, ISBN-10 : 1484233328.*
5. *Nate Ebel - Mastering Kotlin: Learn advanced Kotlin programming techniques to build apps for Android, iOS, and the web, Packt Publishing Limited, 2019, ISBN-10 : 1838555722.*

25-493-0204 CLOUD AND ADVANCED TECHNOLOGIES(D-P)

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Apply cloud solutions on production scenarios using Firebase or DynamoDB	Apply
CO2	Evaluate different cloud service providers, and various cloud service models (FaaS, BaaS)	Evaluate
CO3	Evaluate mobile backend services (mBaaS) and its applications	Evaluate
CO4	Create various cloud service modes (SaaS, PaaS, and IaaS), and deploy solutions based on the model	Create
CO5	Design and create solutions in Amazon Lambda	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	1			2
CO2	2	2	3	3	1			2
CO3	3	2	2	3	1			2
CO4	3	3	3	3	1			3
CO5	3	2	3	3	1			3

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. *IkramHawramani,* 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. *MiteshSoni , 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*

Note: In addition to the above, web references will be provided during the course.

25-493-0207 - SOFTWARE LAB-II (ANDROID & CLOUD)

COURSE DESCRIPTION

This course employs the concepts taught in the second semester for developmental purposes. Cloud 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.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Design Solution based on advanced android Concepts.	Create
CO2	Design solution based on Cloud Concepts	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**3**	**2**	**3**	**3**	**3**			**3**
CO2	**3**	**2**	**3**	**3**				**3**

Module I

Android Advanced concepts with receivers, services, maps

- Retrofit
- Multimedia: Sound and Video
- Location: GPS and Internet, Proximity Alerts
- Google Map: Overlays, Geocoder.
- Web Views
- Volley

Module II

Android concepts with sensors, content providers, email and camera, Room

- 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
- SQLite
- Room

Module III

Advanced Cloud Concepts

- Firebase

- AWS Lambda

REFERENCES

1. *Mark Murphy, The Busy Coder's Guide to Android Development, CommonsWare, 2021, ISBN-13: 978-0981678009*
2. *Bill Phillips, Chris Stewart, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, 4th Edition, Big Nerd Ranch Guides, 2019, ISBN-13: 978-0135245126*
3. *Reto Meier, Professional Android 4 Application Development, Wiley, 2012, ISBN-13: 978-1118102275*
4. *Ed Burnette, Hello, Android: Introducing Google's Mobile Development Platform, 3rd Edition, Pragmatic Bookshelf, 2015, ISBN-13: 978-1680500370*
5. *Dave Smith and Jeff Friesen, Android Recipes: A Problem-Solution Approach, Apress, 2016, ISBN-13: 978-1484206232*
6. *Marko Gargenta and Masumi Nakamura, Learning Android: Develop Mobile Apps Using Java and Eclipse, 2nd Edition, O'Reilly Media, 2014, ISBN-13: 978-1449319237*
7. *Yan Cui, AWS Lambda in Action: Event-driven serverless applications, Manning Publications, 2017, ISBN-13: 978-1617293719.*
8. *Danilo Poccia, AWS Lambda: A Guide to Serverless Microservices, Manning Publications, 2017, ISBN-13: 978-1617293719.*
9. *Frank van Puffelen, Jeevanandam M., Building Firebase-powered Real-time Web Applications with Angular 2, Packt Publishing, 2017, ISBN-13: 978-1788292573.*
10. *Rajeev Hathi, Getting Started with Firebase: Build Apps Quickly Using Firebase, Apress, 2016, ISBN-13: 978-1484216972.*

25-493-0208 INTERNSHIP I – ANDROID/WEB APP DEVELOPMENT

COURSE DESCRIPTION

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.

COURSE OUTCOMES

CO	Learning Outcomes	Cognitive Level
CO1	Evaluate client requirements efficiently	Evaluate
CO2	Prepare project plans, time and workflow management	Create
CO3	Design software requirement specifications accurately	Create
CO4	Develop solutions based on SRS, and design principles	Create
CO5	Design improvements in existing solution	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3				2	2	1
CO2	2	3				3	3	2
CO3	2	3				2	3	2
CO4	2	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3

Objective: To provide students with industrial exposure to real world of Product 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/Web 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.

THIRD SEMESTER

Slno	Course Code	Name of the Course	Hours			Marks		Credits
			L	T	P	Internal	End Semester	
1	25-493-0301	Entrepreneurship and New Venture Planning (G-T)	3			50	50	3
2	25-493-0302	Agile Process Management. (G-T)	3			50	50	3
3	25-493-0303	Programming with Swift (D-P)	3		2	50	50	4
4	25-493-0304	iOS App Development-SwiftUI Framework (D-P)	3		2	50	50	4
5	25-493-0305	Applied Technologies in iOS (D-P)	3		2	50	50	4
6	25-493-03XX	Elective – III	3			50	50	3
7	25-493-03XX	Elective – IV	3			50	50	3
8	25-493-0308	Software Lab III (iOS & Swift) (LAB)			6	50	50	3
9	25-493-0309	Professional Skills Development (Training Programme) (G-T)	2		2	100		3
		Total				**500**	**400**	**30**

* Any Cross Platform Technology may be considered for Elective – III (G- T/D-T)

XX– is the unique two-digit number of the particular elective course from the list of elective courses

25-493-0301 ENTREPRENEURSHIP AND NEW VENTURE PLANNING

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Explain the practical steps involved in starting new ventures.	Understand
CO2	Discuss the financing, taxation regulations and legal requirements applicable to such ventures.	Understand
CO3	Apply different methods of valuation, feasibility analysis, business planning and business model development.	Apply
CO4	Evaluate the modes of financing for securing adequate investment including tapping government support.	Evaluate
CO5	Create business models for mature ideas under start-up mode considering the legal and regulatory requirements	Create

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1						2		2
CO2								3
CO3						1		3
CO4						1		3
CO5						1	2	3

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. *AnjanRaichaudhuri,* 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*

25-493-0302 AGILE PROCESS MANAGEMENT

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand various software product lifecycle, its implementation and different tools used for project management	Understand
CO2	Understand the Agile software development framework	Understand
CO3	Understand the principles and practices required for release, iteration planning, Customer tests, small and regular releases	Understand
CO4	Apply Scrum-based project management	Apply
CO5	Analyze the Kanban project management framework	Analyze

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	1	1	2	2		1		1
CO2	1	1	2	2		2		1
CO3	2	3	2	2		2		1
CO4	2	3	2	2		2		1
CO5	2	3	2	2		2		2

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 , JoakimSunden ,* 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 ManagementandSoftwareDevelopment-PlusTips&TricksforImplementingScrum! (Agile Project Management, Agile Development, Scrum), *CreateSpace Independent Publishing Platform, 2016, ISBN-13: 978-1540315380*
6. *John A Estrella , RossettaSornabala ,* Agile Project Management for Mobile Application Development, *Agilitek Corporation, 2017 , ISBN-13:978-0978435462*

25-493-0303 PROGRAMMING WITH SWIFT

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the operators, data structures, inheritance, and error handling in Swift	Understand
CO2	Analyze access control and enumeration.	Analyze
CO3	Create extensions and their implementations	Create
CO4	Create programs based using class, methods, protocols, generics, flow control, operators, and functions	Create
CO5	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**
CO1	2		1	1				1
CO2	2		2	2				1
CO3	3	2	3	3				1
CO4	3		3	3	2			
CO5	3	1	2	2	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,Enumerations.

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,Overriding,Initialization Types of Initializers, Deinitialization, Optional Chaining, Error Handling,Concurrency,Actors,

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

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/*

25-493-0304 IOS APP DEVELOPMENT

SWIFTUI FRAMEWORK (D-P)

COURSE DESCRIPTION

The course explains the fundamentals of iOS development using the SwiftUI framework. The core concepts in this course are layout stacks, basic views and controls, touchers and gestures, web services, the MVVM design pattern, SwiftUI property wrappers, and backgrounding tasks. By evaluating iOS: Fundamentals using the SwiftUI Framework, the students can create solutions in the production environment using SwiftUI.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the fundamentals of SwiftUI Framework.	Understand
CO2	Apply SwiftUI framework for creating single view application	Apply
CO3	Apply basic views and controls in projects	Apply
CO4	Create application using Backend services and MVVM design Pattern	Create
CO5	Design and create projects that handle backgrounding tasks.	Create

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	**1**							
CO2	**2**	**1**	**1**	**1**	**1**			
CO3	**2**	**1**	**1**	**1**	**2**			
CO4	**3**	**2**	**2**	**3**	**3**			**2**
CO5	**3**	**3**	**3**	**3**	**3**			**3**

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. Introduction to Declarative UI and Storyboard, Creating User Interfaces, Autolayout, Customizing the Interface Appearance, Designing Rotatable and Resizable Interfaces, Stack View, Developer Guidelines and Accessibility(A11y), App, Scene and Scene Builder, Windows.

Module II

Single View Application Template, Layout User Interface with Stacks, State handling, Protocols and

Delegates.

Basic views and controls: Text, Label, TextField, TextEditor, SecureField, Image, AsyncImage, Button, Link, NavigationLink, ToolbarItem, Toggle, Map, Picker, DatePicker, ProgressView, Slider, Stepper, Chart.Shapes.

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 using the Gesture Modifier.

Module III

Web Services(Rest), Decodable, Codable and Codable, AsyncAwait, GCD(Grand Central Dispatch), task and taskGroup, Combine, AVFoundation, System sounds and Haptic feedback, Accessing and Playing the Music Library, Basic Animations and Transitions, NavigationSplitView. Data Sharing with Combine and Environment Objects. Introduction to MVVM Design Pattern, Implementing MVVM with Xcode

Module IV

SwiftUI reusable components, Passing Data between Views, SwiftUI Modifiers and custom modifiers, viewBuilder, Matched Geometry, Geometry Reader.

SwiftUI property wrappers: AppStorage, Binding, Environment, EnvironmentObject, FetchRequest, FocusedBinding, FocusedValue,
GestureState, Namespace, ObservedObject, Published, ScaledMetric, SceneStorage, State, StateObject, UIApplicationDelegateAdaptor.

Module V

Understanding iOS Backgrounding task, 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. *SwiftUI For Dummies, Wei-Meng Lee, For Dummies, ISBN-13: 978-1119771993*
2. *SwiftUI Cookbook: Discover solutions and best practices to tackle the most common problems while building SwiftUI apps, Giordano Scalzo and Edgar Nzokwe, Packt Publishing, ISBN-13: 978-1801812463*
3. *Pro iPhone Development with SwiftUI: Design and Manage Top Quality Apps, Wallace Wang, Apress, 1st ed. edition (March 30, 2022), ISBN-13: 978-1484274088*
4. *SwiftUI for Masterminds 3rd Edition 2022: How to take advantage of Swift and SwiftUI to create insanely great apps for iPhones, iPads, and Macs, J D Gauchat, Independently published, 3rd edition (February 23, 2022), ISBN-13: 978-1803162783*
5. *SwiftUI Tutorials, Apple Inc., https://developer.apple.com/tutorials/swiftui/*
6. *SwiftUI Quick Start, Paul Hudson, Hacking with Swift, https://www.hackingwithswift.com/quick-start/swiftui/*

25-493-0305 APPLIED TECHNOLOGIES IN iOS

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Apply extensions to existing android projects.	Apply
CO2	Differentiate Notifications in iOS and its implementation.	Analyze
CO3	Evaluate cloud kit and data management.	Evaluate
CO4	Develop applications using Managed Objects and Serialization	Create
CO5	Deploy the application using Map and Geolocation components.	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**2**		**2**	**2**	**2**			**1**
CO2	**2**		**2**	**2**	**3**			
CO3	**3**	**2**	**2**	**2**				
CO4	**3**		**3**	**3**	**1**			**1**
CO5	**3**	**2**	**3**	**3**	**3**			**2**

Module 1

Introduction to Data Storage Mechanisms in iOS, Plist Files, File System Storage, KeyChain Storage, 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,Background Location Updation. Registering Geofences. Reacting to Geofence Events, Notifying User of Geofence Event.

Module III

Using the Address Book, Email, Social Networking, Ad Integration, 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. Test Driven Development - Unit Testing, Writing Test cases, UI testing and Code coverage.

Module V

Types of Extensions, Understanding Extensions, API Limitations, Creating Extensions, Today Extension, WidgetKit, WeatherKit, Passkeys, Focus filter API, Live Text API, 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, CosminPupaza, 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.co

LIST OF ELECTIVES

25-493-0AXX: WEARABLE TECHNOLOGIES IN ANDROID

COURSE DESCRIPTION

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 above mentioned features in various projects.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Understand the android wearable environment	Understand
CO2	Understand and analyze the controlling of android phone features in a wearable unit	Understand
CO3	Evaluate data synchronization techniques in applications	Evaluate
CO4	Develop applications using watch faces	Create
CO5	DePOy solutions based on watch face graphics	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1			1			
CO2	2	2	2	2	1			1
CO3	2	2	2	2				1
CO4	3	3	3	3	3			2
CO5	3	2	2	2	2			2

Module I

Introduction to Android OS: OS Layers, Android Architecture, Introducing to ADT, Application Framework. Introduction: SmartWatch Revolution, Android Wear Watches. Setting up the Environment: Android 5 Wearable Application Development. New Features: Familiarization of the Features. ExPOring 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 Notification, 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, Wear Watches Vs Google Glass. 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*

25-493-0AXX: WATCH OS PROGRAMMING

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Understand the user controls and its implementation	Understand
CO2	Understand Apple Watch and its lifecycle	Analyze
CO3	Evaluate storyboard and navigation	Evaluate
CO4	Understand and create Notification and Testing	Create
CO5	Develop application using localization and synchronization	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	2	2	2			
CO2	2		2	2				1
CO3	3	1	2	3	3			2
CO4	3	1	2	2	3			2
CO5	3	3	3	3	3			3

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,* watch OS by Tutorials: Making Apple Watch Apps with watch OS 4 and Swift 4, *Razeware LLC, 3rd edition, 2017, ISBN-13: 978- 1942878452*
2. *ScottLa Counte,* A Beginners Guide to Apple Watch Series 2 and Watch os3, *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 watch OS 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 watch OS 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*

25-493-0AXX: CROSS PLATFORM DEVELOPMENT USING REACT NATIVE

COURSE DESCRIPTION

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

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Understand the architecture used in React Native	Understand
CO2	Apply the debugging and testing functionalities	Apply
CO3	Assess the difference between native, hybrid and cross-platform application development	Analyze
CO4	Develop applications based on user controls	Create
CO5	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
CO1	1	1	1	1	1			1
CO2	2		1	1				
CO3	2	2	1	2				1
CO4	3	3	3	3	2			2
CO5	3	3	3	3	2			2

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, Touchable Opacity, Touchable Highlight, Touchable without Feedback. ActivityIndicator, Modal, ListView, ScrollView, RefreshControl, FlatListSectionList, 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*

Note: In addition to the above, web references will be provided during the course.

25-493-0AXX: iOS APP DEVELOPMENT FUNDAMENTALS USING STORYBOARD FRAMEWORK

COURSE DESCRIPTION

The course explains the fundamentals of iOS development. The core concepts in this course are data-structures, cocoa, foundation frameworks, storyboards, 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.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Understand the fundamentals of iOS.	Understand
CO2	Apply the Cocoa framework for iOS development.	Apply
CO3	Apply User Controls in projects.	Apply
CO4	Create Story Board, MVC, Protocols and Delegates, View System, Controllers, and devise solution based on it.	Create
CO5	Design and create Universal iOS application 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
CO1	**1**							
CO2	**2**	**1**	**1**	**1**	**1**			
CO3	**2**	**1**	**1**	**1**	**2**			
CO4	**3**	**2**	**2**	**3**	**3**			**2**
CO5	**3**	**3**	**3**	**3**	**3**			**3**

Module I

Introduction to Interface Builder and Storyboard, Creating User Interfaces, Autolayout, Customizing the Interface Appearance, Designing Rotatable and Resizable Interfaces, Programmatically Defined Interfaces, Size Classes, and Stack View

Module II

Single View Application Template, Connecting to Code, Outlets and Actions, Building Applications, Developer Guidelines. 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 III

Web Services ,Web Views, Scrolling Views, Alert Controllers, Media Player Frameworks ,System Sound Services, Vibrations, Accessing and Playing the Music Library, Tables and Split View Controllers and Collection View. Introduction to MVC Design Pattern, Implementing MVC with Xcode

Module IV

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

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

2. Matt Neuberg, iOS 11 Programming Fundamentals with Swift, O'Reilly, 2017, ISBN- 13:978-1491999318

3. SerhanYamacli , 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

4. Donny Wals, Mastering iOS 11 Programming, Packt Publishing Limited, 2017, ISBN-13: 978-1788398237

5. Molly K. Maskrey, Beginning iPhone Development with Swift 4: Exploring the iOS SDK , Apress; 4th ed. edition (27 November 2017), ISBN-13: 978-1484230718

6. 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.

*7. Web Reference**:**https://developer.apple.com/*

25-493-0AXX: FLUTTER FOR BEGINNERS

COURSE DESCRIPTION

A cross-platform mobile framework called Google Flutter makes it simple to create high-performance applications for iOS and Android. Students learn the fundamentals of the Dart programming language and the Flutter framework through this course. Students will discover how to create the user interface and incorporate user input features starting with setting up your development environment. Students will Students will learn how to manage app routes with the navigator widget and how to create screen transitions.

COURSE OUTCOMES

CO	Learning Outcomes	Cognitive Level
CO1	Understand the background and scope of Flutter.	Understand
CO2	Familiarizing with basic building blocks of Flutter	Understand
CO3	Apply basic controls to application design	Apply
CO4	Apply database to Flutter application.	Apply
CO5	Create basic to intermediate Flutter application	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	1	1	1			1
CO2	2		1	1				
CO3	2	2	1	2				1
CO4	3	3	3	3	2			2
CO5	3	3	3	3	2			2

Module 1

Introduction: Hybrid Apps vs Native Apps, Introduction to Flutter & Dart, Scope of Flutter. Getting started with dart: Setting up the environment, Variable and Data Types, Operators in dart, Loops and Decision making, Numbers and String, List,Map,Enumeration, Functions, Null Safety, Asynchronous Programming, Object Oriented Principles

Module 2

Introduction to Flutter: Setting up environment for Flutter, understanding flutter project structuring and files, Understanding the boilerplate code, Widgets - Stateless widget and Stateful widget. Understanding basic state management with stateful widget. Writing your first program in Flutter, Familiarising widgets catalogue (Drawer, Material Widgets). Understanding Buttons and other gesture recognizers (InkWell, Gesture Detectors). Managing assets , images and videos in flutter. Adding external packages to Flutter project (Cached Network Image, Toast). Adding Lottie animations to Flutter project. Animation Widgets in Flutter. Develop an Tween loader animation. Working with list of data - Develop an application to convert list of data into UI. Exercise: Building a UI clone of GPay.

Module 3

Developing an application with bottom navigation. Developing an application with Tabs. Understanding navigation in Flutter. Building an application with multiple pages to understand navigation. Handling Forms with Flutter – Designing Forms and Form Widgets (Radio, Dropdown, Checkbox, TextFormFields, Styling form widgets, Slider, Switch). Sanitising data. Validating data in

form. Developing an application for reading contacts in phone using contact_service package and permission_handler Getting familiarised with JSON - Understanding JSON(JSON Object , JSON Array). Encoding and decoding JSON with dart. Building an application by reading a JSON file and converting the data into UI.

Module 4

State management with Cubit - Understanding cubit file structuring. Equatable class Converting an application to cubit (above application for JSON file reading). Understanding singleton class with dart. Local Storage in Flutter - Shared preferences, Hive , Sqflite , Building a basic e-commerce app with cubit and storing data in Shared preferences, Hive, Sqflite, Local notifications. Build flavors – Building application for dev,staging and release flavors

Module 5

Networking in flutter - Making HTTP requests (POST,GET,PUT,DELETE) and understanding the concepts of authentication with flutter(Dio,Fresh Dio), Network Interceptors, Flutter secure storage. Building a release apk configurations. Firebase with flutter - Authentication, Mobile phone number verification flutter, storing data with Firestore database, Realtime database and handling stream of data, sending notifications, deploying a release apk to app deployment. Platform Channels - Implementing platform channel to communicate with native code platforms (Android and iOS)

Reference:

1. Alessandro Biessek - Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, Packt Publishing Limited, 2019, ISBN-10 : 1788996089.
2. Thomas Bailey, Alessandro Biessek, Trevor Wills - Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter 2.5 and Dart, 2nd Edition, Packt Publishing Limited; 2nd edition, 2021, ISBN-10 : 1800565992.
3. Simone Alessandria , Brian Kayfitz - Flutter Cookbook: Over 100 proven techniques and solutions for app development with Flutter 2.2 and Dart, Packt Publishing Limited, ISBN-10 : 1838823387.
4. Richard Rose - Flutter and Dart Cookbook: Developing Full-Stack Applications for the Cloud, Shroff/O'Reilly; First edition, 2023, ISBN-10 : 935542244X.
5. Marco L. Napoli - Beginning Flutter, Wrox; 1st edition, 2019, ISBN-10 : 1119550823.

25-493-0AXX: JAVA MIDDLEWARE USING SPRING BOOT

Course Description

This course is designed to teach students the fundamentals of building a Java middle tier using Spring Boot. The course will cover topics such as RESTful web services, database connectivity, and security. Students will gain hands-on experience building real-world applications using Spring Boot.

Course Outcomes

CO	Learning Outcomes	Cognitive Level
CO1	Understand security in Spring Boot applications	Understand
CO2	Connect to and manipulate databases using Spring Data JPA	Apply
CO3	Use Spring Boot Actuator to monitor and manage applications	Apply
CO4	Design and implement RESTful web services using Spring Boot	Create
CO5	Build and deploy a complete Spring Boot application to a production environment	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		**3**	**1**	**1**				
CO2	**3**		**1**	**2**				
CO3	**3**		**2**					
CO4	**2**	**2**	**3**					
CO5	**2**		**3**					

Module 1: Introduction to Spring Boot

Introduction to Spring Framework and Spring Boot. Setting up a Spring Boot project: Build tool, create a project, Spring Initializer, configure dependencies, spring boot starter. Writing code: annotations, bootstrapping your application. Spring Boot configuration: Configuring Server. Building a simple Spring Boot application: Building package as war or jar.

Module 2: RESTful Web Services with Spring Boot

Introduction to RESTful web services. Building a RESTful web service with Spring Boot: Define endpoints, @RestController, @GetMapping, @PostMapping. Handler methods. Testing: Postman or Curl. Handling errors and exceptions in RESTful web services: Custom error model, @ExceptioHandler, @ControllerAdvice, Specific and Global Exceptions. Consuming RESTful web services.

Module 3: Database Connectivity with Spring Boot

Introduction to Spring Data JPA. Configuring a data source: driver dependency, data source properties, data source bean, JPA properties, entity manager, transaction manager. Creating and manipulating entities with Spring Data JPA: entities and repositories. Writing custom queries with Spring Data JPA: @Query, @NamedMethods, Native Queries, Query Methods.

Module 4: Security in Spring Boot Applications

Introduction to Spring Security. Configuring Spring Security in a Spring Boot application: dependency, WebSecurityConfigurerAdapter, specifying URL, access control. Authentication and authorization in Spring Security. Implementing security for RESTful web services; token-based authentication, OAuth2, HTTP Basic authentication, AuthenticationManager, JwtTokenProvider.

Module 5: Monitoring and Deploying Spring Boot Applications

Introduction to Spring Boot Actuator. Monitoring and managing Spring Boot applications with Actuator: dependency and actuator endpoints. Deploying a Spring Boot application to a production environment: Build, configure, deploy, start, monitor.

REFERENCES:

1. *Craig Walls, "Spring Boot in Action", Manning Publications, 2016, ISBN-13: 978-1617292545*
2. *Felipe Gutierrez, "Pro Spring Boot 2", Apress, 2018, ISBN-13: 978-1484236751*
3. *Alex Antonov, "Spring Boot Cookbook", Packt Publishing, 2016, ISBN-13: 978-1786464898*
4. *Mark Heckler, "Spring Boot: Up and Running", O'Reilly Media, 2018, ISBN-13: 978-1491981470*
5. *Spring Boot official documentation: https://spring.io/projects/spring-boot*

25-493-0AXX: GAME DEVELOPMENT WITH UNITY AND C#

Course Description

This course introduces students to game development using Unity and C#. Students will learn how to create 2D and 3D games, develop gameplay mechanics, implement sound and visual effects, and deploy their games on various platforms.

Course Outcomes

CO	Learning Outcomes	Cognitive Level
CO1	Understand the basics of Unity and C#.	Understand
CO2	Implement gameplay mechanics using C# scripts.	Apply
CO3	Integrate sound and visual effects into their games.	Apply
CO4	Debug and troubleshoot their games	Evaluate
CO5	Create and manipulate game objects using Unity's editor	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**2**	**2**	**1**					
CO2	**2**	**2**	**2**					
CO3	**2**		**2**		**3**			
CO4	**2**		**2**	**2**	**2**			
CO5	**2**		**2**		**2**			

Module 1: Introduction to Unity and C#

Overview of Unity and its features. Introduction to C# programming language. Unity's interface and editor. Creating and manipulating game objects. Unity's scripting API.

Module 2: Creating Gameplay Mechanics

Understanding game mechanics. Using C# scripts to create gameplay mechanics. User input and control. Movement and physics. Collision detection and response.

Module 3: Sound and Visual Effects

Adding sound effects to games. Using Unity's audio system. Creating visual effects using particle systems. Scripting visual effects.

Module 4: Deploying Games

Building and exporting games for different platforms. iOS and Android deployment. Web deployment. PC deployment.

Module 5: Debugging and Troubleshooting

Debugging and troubleshooting techniques. Using Unity's debugging tools. Identifying and resolving common issues.

REFERENCES:

1. *Harrison, H. (2014). Unity in Action: Multiplatform Game Development in C#. Manning Publications. ISBN-10: 161729232X*
2. *Blackman, J. (2013). Unity 4 Fundamentals: Get Started at Making Games with Unity. Peachpit Press. ISBN-10: 0321957725*
3. *Murray, J. (2016). C# Game Programming Cookbook for Unity 3D. Packt Publishing. ISBN-10: 1785280550*
4. *Okita, H. (2017). Unity Virtual Reality Projects: Learn Virtual Reality by Developing More than 10 Engaging Projects with Unity 2017, 2nd Edition. Packt Publishing. ISBN-10: 1788478800*
5. *Murch, B. (2014). Game Physics Cookbook. Packt Publishing. ISBN-10: 178328879X*

25-493-0AXX: PROGRAMMING WITH PYTHON

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the fundamentals of Python and its environment	Understand
CO2	Understand syntax and semantics and advanced python integration	Understand
CO3	Understand advanced Class and Object-Oriented features and its implementation	Understand
CO4	Develop application using statistical and analytical features	Create
CO5	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
CO1	1	1	1	1				
CO2	2		2	2	1			
CO3	2		2	2	2			
CO4	3	2	3	3	3			1
CO5	3	3	3	3	3			1

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, Sub classing, 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: Group By Mechanics, Data Aggregation, Group-wise Operations and Transformations, Pivot Tables and Cross- Tabulation, Time Series: Basics, Date Ranges, 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/*

25-493-0AXX: INTERNET OF THINGS (IOT)

COURSE DESCRIPTION

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.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the fundamentals of IoT, its application and commonly used tools	Understand
CO2	Understand the Constraint Application Protocol (CoAP) and its use	Understand
CO3	Understand the XMPP protocol and its features	Understand
CO4	Analyze the Raspberry Pi tool and its features	Analyze
CO5	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**
CO1	1	1	1	1				
CO2	2	1	2	2				
CO3	2	1	2	2				
CO4	3	3	3	3	1			1
CO5	2	2	2	2				1

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,Cnik H assimally,* Designing The Internet of Things, *John Wiley and Sons, 2015, ISBN-13:978-8126556861*
3. *ArsheepBahga, 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*

Note: In addition to the above, web references will be provided during the course

25-493-0AXX: MACHINE LEARNING FOR SOFTWARE DEVELOPERS

Course Description

The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work. It aims to introduce methods for learning from data.

COURSE OUTCOMES

Learning Outcomes		Cognitive Level
CO1	Understand basic concepts and techniques of Machine Learning.	Understand
CO2	Evaluate the performance of a machine learning system	Evaluate
CO3	Evaluate popular machine learning models	Evaluate
CO4	Devise solutions to practical problems using machine learning	Apply
CO5	Develop improved machine learning models	Create

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**1**	**1**			**1**			
CO2	**2**			**1**				
CO3	**2**	**2**	**2**	**2**	**1**			
CO4	**3**	**2**	**3**	**3**	**1**			
CO5	**3**	**3**	**3**	**3**	**3**		**2**	**3**

Module 1 Machine Learning Basics

Definition of machine learning, Introduction to learning: supervised and unsupervised learning, classification, clustering, regression - Python for Machine Learning. Generalization, Overfitting, and Underfitting, model complexity. Data Pre-processing: Need for Pre-processing the Data, Data Cleaning

Module 2 Supervised learning I

Machine learning models for classification and regression: K Nearest Neighbour classifier, k-neighbors regression, Linear models: Linear regression, Logistic regression, Ridge regression, Linear models for classification, multiclass classification

Module 3 Supervised learning II

Probabilistic classification: Naive Bayes Classifiers, parameter estimation, maximum likelihood method – Decision Trees: Building decision trees, feature importance – Neural networks: Neural network model, tuning neural networks, basic idea of deep neural networks

Module 4 Unsupervised learning

Types of unsupervised learning, Challenges, Applying data transformations – Dimensionality reduction: Pricipal Component Ananlysis (PCA), Non-Negative Matrix Factorization (NMF) – Clustering: K-means clustering, Case study: Comparing image reconstructions using k- means, PCA and NMF – Python exercise on PCA, K-means clustering

Module 5 Model Evaluation and Improvement

Cross validation: Benefits of cross validation, Stratified k-Fold Cross-Validation and Other Strategies – Evaluation metrics and scoring: Metrics for Binary classification- Confusion matrices, precision, recall and f-score - Metrics for Multiclass Classification, Regression metrics

REFERENCES

1. *Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller & Sarah Guido, O'Reilly, 2017, ISBN: 978-1449369415.*
2. *Machine Learning: Mastering the Basics; an In-depth Look at Machine Learning, Fritz Matt, Createspace Independent, 2017, ISBN: 978-1543127947.*
3. *Machine Learning in Action, Peter Harrington, Dreamtech Press, 2012, ISBN: 978-1617290183.*
4. *Data Mining: Practical Machine Learning Tools and Techniques, 3 e., Ian H. Witten, Eibe Frank and Mark A. Hall, Morgan Kaufmann, 2018, ISBN: 978-0128042915.*
5. *Learning From Data, Yaser S. Abu-Mostafa, Malik Magdon-Ismail and Hsuan-Tien Lin, AMLBook, 2012, ISBN: 978-1600490064.*
6. *Machine Learning: An Algorithmic Perspective, Stephen Marsland, Chapman and Hall/CRC, 2014, ISBN: 978-1466583283.*
7. *The Elements of Statistical Learning,2e., T. Hastie, R. Tibshirani, J. Friedman, Springer Series, 2017, ISBN: 978-0387848570.*
8. *Pattern Recognition and Machine Learning, 2e., Christopher Bishop, Springer-verlag, 2011, ISBN: 978-0387310732.*

25-493-0AXX: INTRODUCTION TO ANDROID AUTO

Course Description

Familiarizes students with Android Auto SKD and its related technologies.

Course Outcomes

CO	**Learning Outcomes**	**Cognitive Level**
CO1	Understand the basic features and functions of Android Auto.	Understand
CO2	Connect and set up Android Auto in a compatible car or on a phone.	Apply
CO3	Use Android Auto to navigate, make calls, send messages, and play music.	Analyze
CO4	Customize Android Auto to suit individual preferences and needs.	Apply
CO5	Troubleshoot common issues with Android Auto.	Evaluate

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	**3**	**2**	**3**					
CO2	**2**	**2**	**2**					
CO3	**3**		**2**		**3**			
CO4	**1**		**2**	**3**	**3**			
CO5	**1**		**2**		**3**			

Module 1: Introduction to Android Auto

What is Android Auto?. Advantages of using Android Auto. Compatible devices and cars. Android Auto app and setup. Android Auto UI overview.

Module 2: Navigation with Android Auto

Google Maps and Android Auto Navigation. Searching for destinations. Navigation settings and options. Voice commands for navigation. Navigation tips and tricks.

Module 3: Communication with Android Auto

Hands-free calling with Android Auto. Contact management. Making and receiving calls. Sending and receiving text messages. Voice commands for communication

Module 4: Media and Entertainment with Android Auto

Playing music on Android Auto. Supported media apps. Creating playlists and managing music. Podcasts and audiobooks on Android Auto. Voice commands for media playback.

Module 5: Customization and Troubleshooting

Customizing Android Auto settings. Changing the wallpaper and display. Troubleshooting common issues with Android Auto. Tips for optimizing Android Auto performance.

REFERENCES

2. *Google, Android Auto User Guide, Google, 2022, ISBN: 978-1-63585-045-1.*
3. *Alan J. Pierce, Android Auto Development Essentials: Learn to Develop Android Auto Applications Using Android Studio and Kotlin, Independently Published, 2021, ISBN: 979-8746647982.*
4. *Paul Deitel, Harvey Deitel, and Alexander Wald, Android 11 App Development Essentials: Android 11 for Android Studio and Kotlin Fundamentals, Pearson, 2021, ISBN: 978-0-13-680197-0.*

25-493-0AXX: AUGMENTED REALITY FOR IOS APP DEVELOPMENT USING ARKit

Course Description:
This course is designed to teach students the fundamentals of developing augmented reality applications for iOS devices using ARKit. Students will learn how to use ARKit to create 3D models, place objects in the real world, and interact with them using the iOS device's camera and sensors. The course will cover key concepts and techniques for designing and developing AR applications that are functional, interactive, and visually compelling.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the principles of augmented reality and its applications in iOS app development.	Understand
CO2	Design and develop augmented reality applications using ARKit 6 and SwiftUI.	Create
CO3	Use 3D modeling software to create 3D models for AR applications.	Apply
CO4	Implement advanced AR features such as object occlusion and collaborative sessions.	Create
CO5	Apply user interface and user experience (UI/UX) design principles to create intuitive and user-friendly AR applications.	Apply

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	**3**	**3**	**3**	**2**	**1**			**2**
CO2	**2**	**2**	**2**	**2**	**1**			**2**
CO3	**3**	**2**	**2**		**1**			
CO4	**3**		**2**		**1**			**3**
CO5	**3**		**2**		**1**			

Module 1

Introduction to augmented Reality, Augmented Reality applications, Introduction to ARKit and its capabilities, Designing an Augmented Reality Experience, Setting up the development enviorment, Creating an AR Project with SwiftUI, Building Your First ARKit App, Working with ARKit's SceneKit and SpriteKit frameworks, Designing AR user interfaces and interaction models

Module 2: ARKit Essential

Understanding ARKit's Coordinate System, Placing Objects in AR, Interacting with AR Objects, Using Gestures to Manipulate AR Objects, Implementing Object Occlusion

Module 3: Advanced ARKit Features

Collaborative Sessions, Image Recognition and Tracking, Plane Detection and Tracking, Motion Tracking, Lighting and Shadows in AR

Module 4: 3D Modeling for AR

Introduction to 3D Modeling, Creating 3D Models for AR, Exporting 3D Models for AR, Importing 3D Models into ARKit

Module 5: Designing User Interfaces for AR

Designing User Interfaces for AR, Creating Intuitive AR Interfaces with SwiftUI, Testing and Iterating on AR Interfaces, Integrating AR with Native iOS User Interfaces

REFERENCES:

1. *"Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR" by Steve Aukstakalnis and Joseph J. LaViola Jr.,Addison-Wesley Professional,ISBN: 978-0134094236*

2. *"ARKit 2 by Tutorials: Creating Augmented Reality Apps in Swift 4.2" by Caroline Begbie, Cristina Santos, et al.,Razeware LLC,ISBN: 978-1942878909*

3. *"Learning ARKit: Develop Augmented Reality Apps for iOS" by Joshua Newnham, Apress,ISBN: 978-1484238250*

4. *"ARCore Overview" from the Google Developers website, URL: https://developers.google.com/ar/overview*

5. *Apple Developer Documentation for ARKit 6 and SwiftUI: https://developer.apple.com/augmented-reality/arkit/*

25-493-0AXX: CYBER SECURITY

Course Description:

This course provides an introduction to cyber security, covering the basic concepts, principles, and practices of cyber security, and the common threats and vulnerabilities faced by organizations and individuals. The course will cover topics such as network security, encryption, identity and access management, risk management, and incident response.

COURSE OUTCOMES

Learning Outcomes		**Cognitive Level**
CO1	Understand the basic concepts, principles, and practices of cyber security.	Understand
CO2	Identify the common threats and vulnerabilities faced by organizations and individuals.	Analyse
CO3	Design and implement effective cyber security programs and policies	Create
CO4	Develop the skills to detect and respond to cyber security incidents	Analyse
CO5	Application of cyber forensics when an incident occurs.	Apply

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	**1**		**3**	**2**				
CO2	**2**		**2**	**2**				
CO3	**2**		**2**					
CO4	**3**		**2**					
CO5	**2**		**2**					

Module 1: Introduction to Cyber Security
Overview of cyber security threats and vulnerabilities, Introduction to common cyber security platforms and their security features, Overview of cyber security frameworks and regulations
Best practices for designing cyber security programs.

Module 2: Network Security
Overview of network security threats and vulnerabilities, Introduction to network security technologies and protocols, Best practices for designing secure networks and protecting against attacks, Introduction to network monitoring and incident response

Module 3: Cryptography and Encryption
Introduction to cryptography and encryption, Overview of common encryption algorithms and their uses, Best practices for designing secure encryption systems, Introduction to digital signatures and key management

Module 4: Identity and Access Management
Overview of identity and access management (IAM), Introduction to authentication and authorization technologies and protocols. Best practices for designing secure IAM systems
Introduction to single sign-on (SSO) and multi-factor authentication (MFA)

Module 5: Risk Management and Incident Response
Introduction to risk management and threat modeling, Overview of incident response planning and management, Best practices for incident response and data breach notification
Introduction to forensics and evidence collection.

REFERENCES:

1. *Cybersecurity Essentials, Eric Conrad, Seth Misenar, and Joshua Feldman,Syngress ISBN: 978-0128016782*
2. *CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide, Mike Chapple, James Michael Stewart, and Darril Gibson, Sybex ISBN: 978-1119523260*
3. *Network Security Essentials: Applications and Standards,William Stallings,Pearson ISBN: 978-0134527338*
4. *Practical Cryptography, Niels Ferguson and Bruce Schneier,Wiley, ISBN: 978-0471223573*
5. *Identity and Access Management*