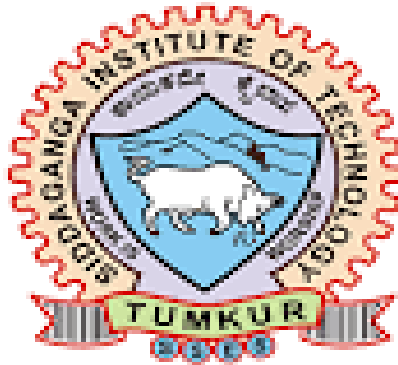


Siddaganga Institute of Technology-Tumakuru

Department of Master of Computer Applications



SCHEME & SYLLABUS (III & IV Semester)

2024-2026

VISION STATEMENT

“To effectively mould quality and responsible computer professionals with a service mindset and spirituality for nurturing the global technological competence”.

MISSION STATEMENT

<u>M1:</u>	<i>To develop computer professionals with technical proficiency, soft skills, ethical values, and a service-oriented mindset.</i>
<u>M2:</u>	<i>To foster research, innovation, and problem-solving skills catering to the needs of industry, academia, and society.</i>
<u>M3:</u>	<i>To promote entrepreneurship and continuous adaptability to emerging technologies.</i>

Program Educational Objectives

- PEO 1** Graduates will have strong theoretical and technical proficiency to meet the evolving global needs of society, industry, and academia.
- PEO 2** Graduates will demonstrate professionalism, teamwork, and ethical values in solving innovative problems.
- PEO 3** Graduates will engage in continuous learning and upskilling to adapt to emerging technologies and practices.
-

Program Outcomes (POs)

- PO1: (Foundation Knowledge): Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.
- PO2: (Problem Analysis): Identify, review, formulate and analyse problems for primarily focusing on customer requirements using critical thinking frameworks.
- PO3: (Development of Solutions): Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.
- PO4: (Modern Tool Usage): Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.
- PO5: (Individual and Teamwork): Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.
- PO6: (Project Management and Finance): Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.
- PO7: (Ethics): Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware
- PO8: (Life-long learning): Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.
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Master of Computer Applications (MCA)											
Scheme of Teaching and Examinations – 2024-2026											
III SEMESTER											
Sl. No	Course	Course Code	Course Title	Teaching Hours per Week			Examination				Credits
				Theory	Practical / Seminar	Development Activities (Hours are for interaction between faculty)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA/ Tutorial					
1	PEC	S3MCXX	Specialization	03			03	50	50	100	03
2	PEC	S3MCXX	Specialization	03			03	50	50	100	03
3	PEC	S3MCXX	Specialization	03			03	50	50	100	03
4	PROJ	S3MCP	Project		25 – 30 hours per week		03	50	50	100	15
Total Credits							12	200	200	400	24

Specialization B (AI & Data Science)		Specialization C (Application Development)		Specialization D (Allied courses)	
Course Code	Course Title	Course Code	Course Title	Course Code	Course Title
S3MCBA	Artificial Intelligence and Machine Learning	S3MCCA	Mobile Application Development	S3MCDA	Software Testing
S3MCBB	Data analytics	S3MCCB	C# using .Net	S3MCDB	Big Data
S3MCBC	Generative AI and Prompt Engineering	S3MCCC	ARVR	S3MCDC	Digital Marketing
S3MCBD	Business Intelligence and Analytics	S3MCCD	Rich Internet Application Development	S3MCDD	Agile Software Processing

Master of Computer Applications (MCA)**Scheme of Teaching and Examinations – 2024-2026****IV SEMESTER**

Sl. No	Course	Course Code	Course Title	Teaching Hours per Week			Examination				Credits
				Theory	Practical / Seminar	Skill Development Activities (Hours are for interaction between faculty and students)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA					
1	MOOC	S4MCMOOC	Online Courses (12 Weeks Duration)				--	--	---	100	03
2	TS	S4MCTS	Technical Seminar /Paper Presentation				03	100	---	100	02
3	INT	S4MCINT	Research Internship /Industry-Internship / Startup Internship					100	100	200	11
Total							06	200	100	400	16

INT: Industry/ Research Internship leading to the project work /startup

TS: Technical Seminar: Students can present the seminar based on the new technologies in the seminar by all postgraduate students of the program shall be mandatory. The CIE marks awarded for the Seminar shall be based on the evaluation of the Report, Presentation skill, and performance in the Question and Answer session in the ratio 50:25:25. Seminar shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/ complete shall be declared as fail in the seminar course and have to complete the same during the subsequent semester.

MOOC : Online NPTEL course (12 Week Duration)

Semester wise credits distribution:

1 st Semester	2 nd Semester	3 rd Semester	4 th Semester	Total
22	18	24	16	80

Specialization B (AI & Data Science)

Artificial Intelligence and Machine Learning

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCBA	Course	:	

Course Objectives:

This Course will enable students to:					
1.	Realize the significance of Machine learning and data pre-processing				
2.	Understanding the data mining algorithms for classification				
3.	Understanding association and clustering techniques				

UNIT – I	08 Hours
Introduction to artificial intelligence, Acting humanly and thinking humanly, thinking rationally and acting rationally, Intelligent Agents: Agents and Environments, Good Behaviour: The concept of Rationality: Rationality, Omniscience, Learning and autonomy, The nature of Environments: specifying the task environment, properties of task environments, The structure of Agents: Agent Programs, simple reflex agents, Model-based reflex agents, Goal-based agents, Utility based agents, Learning agents, How the components of agents programme work	

UNIT – II	08 Hours
Introduction to Machine learning. Applications of machine learning. Types of data interval-scaled variables, binary variables, categorical, ordinal, ratio-scaled variables, Data Pre-processing: Why pre-process data, Descriptive data summarization – measuring the central tendency, dispersion of data, Data cleaning - missing values, noisy data, data cleaning as process, Data integration and Transformation , data reduction – data cube aggregation, attribute subset selection.	

UNIT – III	08 Hours
Introduction to classification and prediction, Classification by decision tree induction algorithm, attribute selection method: information gain, gain ratio, Gini index. Lazy learners: k-nearest-neighbor classifier, Prediction: Linear regression.	

UNIT – IV	08 Hours
Bayesian Classifier, Rule based classifier, Accuracy and error measures- classifier accuracy measure, predictor error measures, evaluating the accuracy of a classifier or predictor – holdout method and random sub sampling, cross validation, bootstrap. Introduction of ensemble method bagging, Model selection: ROC curves	

UNIT – V	08 Hours
Introduction to Cluster analysis Typical requirements of clustering, A categorization of major clustering methods, Partitioning Methods: The K-means method, K-medoids clustering, Hierarchical methods: Agglomerative and Divisive hierarchical clustering, plotting Dendrogram, Measures for distance between clusters: Minimum distance, maximum distance, average distance. Density based methods : DBSCAN	

TEXT BOOKS:

1.	Jiawei Han & Micheline Kamber, Data Mining Concepts and Techniques , Morgan Kaufmann Publishers – Fourth Edition - 2023
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2	Artificial Intelligence: A Modern Approach , Stuart Russel PeterNorvig, Pearson Education, 4th edition 2020
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REFERENCE BOOKS:

1.	Tom M. Mitchell, Machine Learning, McGraw Hill Education, First Edition, 2017
2.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar , Introduction to Data mining, Pearson Education -2020

WEB LINKS:

1.	https://www.geeksforgeeks.org/machine-learning/
2.	https://www.w3schools.com/python/python_ml_getting_started.asp
3.	https://www.javatpoint.com/machine-learning

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Analyse and develop Artificial Intelligent agents for simple applications.
CO2	Apply data preprocessing steps for real world data applications
CO3	Analyze various classification techniques and their applications
CO4	Analyze various clustering techniques and their applications

Course Articulation Matrix (Mapping between COs and POs):

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	2	2	1	1	1			
	CO2	2	2	2	1	1			
	CO3	2	2	2	1	1			
	CO4	2	2	2	1	1			

1: Low, 2: Medium, 3: High

Data Analytics

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCBB	Course	:	

Course objectives:

This course will enable students to:

1.	Apply various locations, shape and dispersion measures and interpret the results for better understanding of data
2.	Use various visualization techniques and interpret the plots for understanding data
3.	Apply different types of correlation among data to interpret the association among data and interpret the outcome
4.	Apply various time series forecasting method for prediction and interpret the outcome
5.	Apply various types of hypothesis testing and interpret the outcome.

UNIT I

Introduction to Data analytics, Difference between data mining, data science and data analysis, descriptive and inferential statistics. Attribute understanding: types of attributes (numerical). Types of Attributes (categorical), Data Quality issues. Descriptive Statistics : Characteristic Measures for one dimensional data – Locations measures (ungrouped data), Dispersion measures, Shape measures (ungrouped data), Location measures with grouped data, Dispersion measures for grouped data, Shape measures for grouped data, One dimensional Data Visualization : histogram, bar chart, pie-chart, stem and leaf, One dimensional Data Visualization : boxplot; 2D plot: Scatter plot, Frequency distribution Table, ogive plot

8 Hours

UNIT II

Visualization Methods for Higher dimensional data: Parallel Coordinates, Radar Plot, Characteristics Measures for Multidimensional Data: Correlation analysis- Pearson's Correlations coefficient. Ranks correlation – Spearman's rank correlation (without tie case), Ranks correlation – Spearman's rank correlation (with tie case), Kendall's tau rank correlation coefficient (without tie case), Kendall's tau rank correlation coefficient (with tie case), Linear Regression, Outlier Detection for single and multidimensional data, Multiple correlations, Partial correlation coefficients.

8 Hours

UNIT III

Time series Analysis: Importance of Time series analysis, components of a time series, Trend of time series using method of simple moving average, Simple weighted moving average, weighted moving centred average method, Centred moving average (Odd and even years), Trend chart, Method of least square, Linear regression method for forecasting, Simple exponential smoothing, Adjusted exponential smoothing, Forecasting using seasonal indexing

8 Hours

UNIT IV

Testing of Hypothesis – Introduction to hypothesis testing, Procedure of testing hypothesis,

Type I error, Tails of a test, Z test : Lower Tail Test of Population Mean with known variance, Upper Tail Test of Population Mean with known Variance, Two-Tailed Test of Population Mean with Known Variance, t test : Lower Tail Test of Population Mean with Unknown Variance, Upper Tail Test of Population Mean with Unknown Variance, Two-Tailed Test of Population Mean with Unknown Variance, Chi-square distribution- properties, Chi-square distribution the goodness of fit test, Chi-square distribution test of independence, Chi-square distribution test of homogeneity.

8 Hours

UNIT V

Data Preparation: Select Data – Feature Selection, Dimensionality Reduction Record Selection. Clean data – improve data quality, missing values. Construct data – Provide operability, assure impartiality (Data transformation). Data Integration: Vertical and Horizontal data integration (different types of joins). Data analysis process- CRISP-DM process.

8 Hours

TEXT BOOKS

- 1 Michael R. Berthod, Christian Borgelt, Frank Hoppner, Guide to Intelligent Data Analysis, Springer Series, 2020
- 2 G C Beri, Business Statistics, 3rd Edition. Tata Mc-GrawHill, 2017

REFERENCE BOOKS

- 1 Christina Albright, Wayne L. Winston, Business Analytics: Data Analysis and Decision Making, CENGAGE 5th edition, 2020
Web resource: <http://www.r-tutor.com/elementary-statistics/hypothesis-testing>

Course Outcomes:

Upon completion of this course the student will be able to:

CO1	Apply various Data Preparation methods; Compute various locations, shape and dispersion measures and interpret the results.
CO2	Apply various visualization techniques and interpret the plots.
CO3	Apply different types of correlation methods among data to interpret the association among data.
CO4	Apply various time series forecasting method for prediction and interpret the outcome.
CO5	Apply various types of hypothesis testing and interpret the outcome.

Course Articulation Matrix

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	2	2	1					
	CO2	2	2	1					
	CO3	2	2	1					
	CO4	2	2	1					
	CO5	2	2	1					

Generative AI and Prompt Engineering

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCBC	Course	:	

Course objectives:

This course will enable students to:

1.	To provide a comprehensive understanding of generative AI models and their applications.
2.	To explore the key components and workings of LangChain and its comparison with other frameworks.
3.	To develop skills for building and implementing chatbots using advanced retrieval and vector techniques.
4.	To introduce the fundamentals and importance of prompt engineering in AI communication.
5.	To equip students with best practices and strategies for writing effective prompts and addressing common challenges in prompt engineering.

UNIT I

Introducing generative AI: Generative models, Understanding LLMs and GPT, Other LLMs, Major players, Working of GPT models, Pre-training, Tokenization, Scaling, Conditioning, text-to-image models, LangChain for LLM Apps: Going beyond stochastic parrots, limitations of LLMs, mitigating LLM limitations, LLM app.

8 Hours

UNIT II

Exploring key components of LangChain, chains, agents, memory, tools, working of LangChain, Comparing LangChain with other frameworks, Building a Chatbot like ChatGPT and chatbot, Understanding retrieval and vectors, Embeddings, Vector storage, Vector indexing, Vector libraries, Vector databases, Loading and retrieving in LangChain, Document loaders, Retrievers in LangChain, kNN retriever, PubMed retriever, Custom retrievers

8 Hours

UNIT III

Implementing a chatbot, Document loader, Vector storage, Memory, The Future of Generative Models, The current state of generative AI, Challenges, Economic consequences: Creative industries and advertising, Education, Law, Manufacturing, Medicine, Military, Societal implications: Misinformation and cyber security, Regulations and implementation challenges.

8 Hours

UNIT IV

Introduction to ChatGPT, Overview of Large Language Models, Output Formats Generated By ChatGPT, Use Cases for ChatGPT, Differences Between ChatGPT and Web Search, Introduction to Prompt Engineering: Definition of Prompt Engineering, Importance of Prompt Engineering in AI Communications, Overview of the Different Types of Prompts, Understanding the Foundation of Prompt Engineering, Power Up Your Prompts With Effective Verbs, Elevate Your Prompts with Nuances of Tone, Progressive Experimentation for Refining Prompts

8 Hours
UNIT V
Writing Effective Prompts, Key Attributes of Good Prompt Writing, Tips for Getting the Most Out of Prompt Responses, Best Practices in Prompt Engineering: Understanding the Nuances of Language & Tone, Testing & Iterating Prompts for Improved Performance, Incorporating Feedback from AI Models to Refine Prompts, Enhancing Reliability of Responses, Give More "Think Time" to the Model, Staying Up to Date with the Latest Advancements, Tips for Getting the Most Out of Prompt Responses, Challenges in Prompt Engineering: Addressing Common Challenges & Pitfalls, Strategies for Improving Prompt Effectiveness, Ethical Considerations in Prompt Engineering.
8 Hours

TEXT BOOKS

1	Ben Auffarth, Generative AI with LangChain, Packt Publishing Ltd., 1st Edition, 2023
2	Harish Bhat, Demystifying Prompt Engineering, Harish Bhat, 1 st Edition, 2023

REFERENCE BOOKS

1	David Foster, "Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play., O'Reilly Media, 2nd Edition, 2023
2	James Phoenix, Mike Taylor, Prompt Engineering for Generative AI: Future-Proof Inputs for Reliable AI Outputs, O'Reilly Media, 1 st Edition, 2024

Course Outcomes:

Upon completion of this course the student will be able to:

CO1	Gain a solid understanding of generative AI models, including large language models and text-to-image models.
CO2	Utilize LangChain for developing advanced LLM applications and understand its components and functionalities.
CO3	Develop skills in implementing chatbots, managing vector storage
CO4	Understand the principles of prompt engineering and learn how to design effective prompts for various AI applications.
CO5	Apply best practices in prompt engineering, address challenges, and incorporate ethical considerations in their work.

Course Articulation Matrix

	POs								
		1	2	3	4	5	6	7	8
COs	CO1		2			1			
	CO2		2			1			
	CO3		2			1			
	CO4		2		1	1			
	CO5		2			1			

Business Intelligence and Analytics

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCBD	Course	:	

Course objectives:

This course will enable students to:

1.	Understand the fundamental concepts of Business Intelligence, Business Analytics, Decision Support Systems, and Big Data Analytics.
2.	Analyze the decision-making process, including the intelligence, design, choice, and implementation phases, and evaluate DSS capabilities and components.
3.	Apply machine learning and predictive techniques such as Neural Networks, Support Vector Machines, Nearest Neighbor, and Sentiment Analysis to solve business problems.
4.	Develop model-based decision-making solutions using mathematical models, optimization techniques, spreadsheets, decision tables, decision trees, and multi-criteria decision-making methods.
5.	Design and implement automated decision systems and expert systems using artificial intelligence principles, knowledge engineering, and expert system development methodologies.

UNIT I

An Overview of Business Intelligence, Analytics, and Decision Support

Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics,

8 Hours

UNIT II

Decision Making Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Decision Support Systems Classification, Decision Support Systems Components.

8 Hours

UNIT III

Neural Networks and Sentiment Analysis Basic Concepts of Neural Networks, Developing Neural Network-Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, A Process Based Approach to the Use of SVM, Nearest Neighbor Method for Prediction, Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process,, Sentiment Analysis, Speech Analytics.

8 Hours

UNIT IV

Model-Based Decision Making Decision Support Systems modeling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets, Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making With Pairwise Comparisons.

8 Hours

UNIT V	
Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems.	
8 Hours	

TEXT BOOKS

1	Ramesh Sharda, Dursun Delen, Efraim Turban, J.E. Aronson, Ting-Peng Liang, David King, Business Intelligence and Analytics: System for Decision Support”, 10th Edition, Pearson Global Edition, 2018
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REFERENCE BOOKS

1	Edward Mize, Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback November 2017
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Course Outcomes:

Upon completion of this course the student will be able to:

CO1	Illustrate the fundamental concepts of Business Intelligence, Analytics, Decision Support Systems, and Big Data Analytics.
CO2	Analyze the decision-making process, including intelligence, design, choice, and implementation phases, and identify DSS components and classifications.
CO3	Apply machine learning techniques, Neural Networks and Sentiment Analysis methods for predictive and analytical solutions.
CO4	Develop model-based decision-making solutions using mathematical models, optimization techniques and multi-criteria decision-making methods.
CO5	Design and implement automated decision systems and expert systems using artificial intelligence principles, knowledge engineering, and expert system development methodologies.

Course Articulation Matrix

	POs								
		1	2	3	4	5	6	7	8
COs	CO1	2	2	1		1			
	CO2	2	2	1		1			
	CO3	2	2	1		1			
	CO4	2	2	1		1			
	CO5	2	2	1		1			

Specialization C (Application Development)

Mobile Application Development

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCCA	Course	:	

Course objectives:

This course will enable students to:

1.	Provide a solid foundation in Android application development, from setup to advanced features.
2.	Develop proficiency in mobile design principles, event handling, activities, and multithreading.
3.	Enable students to implement debugging, testing, data storage, and location-based services in Android.
4.	Introducing students to Flutter & Dart programming for cross-platform mobile app development.
5.	Equip students with knowledge of state management, user forms, and Firebase integration in Flutter.
6.	Encourage hands-on practice through structured lab exercises and real-time projects.

UNIT I

Introduction to Android overview, Android Studio & Project Basic:

History, Operating System, Setup, Configuring Android Studio, Hardware Acceleration, Project Basics, Create an AVD, The IDE, Main Editor, Editing Layout Files, TODO Items, Project Tool Window and Android Application Overview.

Getting Started with Android Programming

Introduction to Android – Obtaining the required tools– Anatomy of an Android Application – Components of Android Applications

8 Hours

UNIT II

Mobile Design, Event Handling, Fragments, Execution: Mobile Design: Mobile-Only Interactions, Interactions that are not possible on Mobile

Event Handling & Intents: Intro to Event Handling, Handling Long Clicks, What Intents are for, Implicit Intents

Introduction to Fragments Running in the Background: Basic Concepts, The UI Thread, Threads and Runnable

Activities and Layouts:

What Makes Up an Android Project, Application Entry Point, Activities, Intents, Activity, Layout File, View and View Group Objects, Containers, Activity Class

8 Hours

UNIT III

Debugging, Data Storage & Location Services: Debugging & Testing, Types of Errors Debugger, Types of Testing, Unit Testing, Instrumented Testing

Data Storage: Storing simple data, Read and write a text file to internal storage or external storage, Creating and using an SQLite database

8 Hours

UNIT IV**Introduction to Flutter and Dart**

1.1 Introduction to Flutter: Introduction to Flutter, Features & architecture, Flutter vs Native & Hybrid frameworks and Setting up development environment (Flutter SDK, Android Studio/VS Code)

1.2 Introduction to Dart Programming : Dart syntax and structure, Data types, variables, and functions, Object-Oriented Programming in Dart (classes, constructors, inheritance)

1.3 Flutter Basics : Flutter app structure (main.dart, MaterialApp, Scaffold), Hot reload and development workflow, Basic widgets: Text, Image, Container, Row, Column, ListView

1.4 Layout and Navigation: Layout widgets: Padding, Margin, SizedBox, Stack, Card, Navigation: Navigator, routes, passing data between screens, Building a simple multi-page app

8 Hours**UNIT V****State Management, Forms, and Firebase Basics**

2.1 State Management : Stateful vs Stateless widgets, Managing local state using setState(), Introduction to Provider (basic example)

2.2 User Input and Forms: TextFields, buttons, switches, Form validation, AlertDialogs and snackbars

2.3 Connecting with Firebase: Introduction to Firebase services, Firebase setup for Flutter project, Firebase Authentication (Email/Password), Realtime Database or Firestore (CRUD basics)

8 Hours**TEXT BOOKS**

1	Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wrox, 1 st Edition, 2012, ISBN: 978-1-118-20390-3
2	Wei-Meng Lee, Beginning Android Application Development, Wiley India Private Limited 2011.
3	Alessandro Biessek, Flutter for Beginners, Packt Publishing Limited, 2019
4	Marco L. Napoli, Beginning Flutter, Wiley, 2020.

REFERENCE BOOKS

1	Reto Meier, Professional Android 4 Application Development”, Wrox Publications 2012
2	Ted Hagos, Learn Android Studio 4: Efficient Java-Based Android Apps Development, Apress Publishing, 2nd Edition, 2020,
3	Carmine Zaccagnino, Programming Flutter: Native, Cross-Platform Apps the Easy Way, O'Reilly, 2020.
4	Simone Alessandria, Flutter Cookbook, Packt Publishing, 2021.

WEB LINKS:

1	https://www.tutorialspoint.com/android/index.htm
2	https://developer.android.com/
3	https://www.geeksforgeeks.org/android-tutorial/

4	Dart Language Documentation – https://dart.dev
5	Firebase & Flutter – https://firebase.flutter.dev
6	Youtube tutorial - https://www.youtube.com/watch?v=CzRQ9mnmh44

Course Outcomes:

Upon completion of this course the student will be able to:

CO1	Demonstrate understanding of Android fundamentals, development environment setup, and the anatomy of Android applications.
CO2	Apply mobile design principles, event handling, intents, and activities to develop interactive Android applications.
CO3	Implement debugging, testing, data storage, and location services in Android applications.
CO4	Develop cross-platform mobile applications using Flutter and Dart with basic widgets, layouts, and navigation.
CO5	Build Flutter applications with state management, form handling, and Firebase integration for cloud-based services.

Course Articulation Matrix

	POs								
		1	2	3	4	5	6	7	8
COs	CO1	2	2			1			
	CO2	3	3	2	3	1			
	CO3	3	3	2	3	1			
	CO4	3	3	2	3	1			
	CO5	3	3	3	3	1			

C# using .Net

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCCB	Course	:	

Course objectives:

This course will enable students to:

1.	Understand .NET framework and C# language features.
2.	Apply object-oriented concepts in C# programming.
3.	Use collections, file handling, and exception management.
4.	Develop GUI applications using Windows Forms.
5.	Introducing ASP.NET web development.
6.	Understand .NET framework and C# language features.

UNIT I

Introduction to C# and .NET:

.NET Framework architecture, C# syntax, data types, variables, Control structures: if, switch, loops, and Visual Studio environment

8 Hours

UNIT II

Object-Oriented Programming:

Classes and Objects, Encapsulation, Inheritance, Polymorphism, Interfaces and Abstract Classes, and Method Overloading and Overriding

8 Hours

UNIT III

Advanced C# Programming:

Delegates and Events, Collections and Generics, Exception Handling, and Properties and Indexers

8 Hours

UNIT IV

File Handling and Multithreading:

File I/O with StreamReader and StreamWriter, Binary File operations, Thread class and Synchronization, and Serialization and Deserialization

8 Hours

UNIT V

Building .NET Web APIs (ASP.NET Core):

Introduction to REST and .NET Web API fundamentals, API - GET, POST, PATCH, PUT, DELETE, and Endpoint design: CRUD operations, validation, error handling, pagination

8 Hours

TEXT BOOKS:

1.	Herbert Schildt, "The Complete Reference: C# 4.0", Tata Mc Graw Hill, 2017.
2.	Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.

REFERENCE BOOKS:

1.	Andrew Troelsen , “Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2.	Ian Griffiths, Matthew Adams, Jesse Liberty, “Programming C# 4.0”, Sixth Edition, O’Reilly, 2010.

WEB LINKS:

1.	https://www.javatpoint.com/c-sharp-tutorial
2.	https://www.w3schools.com/cs/index.php
3.	https://www.tutorialsteacher.com/csharp

Course Outcomes:

After the completion of this course, students will be able to:	
CO1	Explicate the major elements of the .NET frame work
CO2	Elucidate Object Oriented Aspects of C#:
CO3	Analyze the basic structure of a C# application
CO4	Develop programs using C# on .NET

Course Articulation Matrix (Mapping between COs and POs):

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	1	1			1			
	CO2	2	2			1			
	CO3	2	2			1			
	CO4	2	2			1			

1: Low, 2: Medium, 3: High

ARVR

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCCC	Course	:	

Course Objectives:

This Course will enable students to:	
1.	Gain the knowledge of Virtual Reality concepts and its implication.
2.	Understand the Input-Output interactions in Virtual Reality
3.	Understand role of Computer Graphics in Virtual reality
4.	Gain the knowledge of Architecture of Augmented Reality

UNIT – I	08 Hours
Introduction to Virtual Reality: History of Virtual Reality, Types of Virtual Reality, Three I's of Virtual Reality, Architecture / Components of Virtual Reality, Applications of Virtual Reality Common Issues of Human Communication Media	

UNIT – II	08 Hours
Input Devices: Trackers: Three Dimensional Position Trackers: Tracker Performance Parameters, Mechanical Trackers, Magnetic Trackers, Optical Trackers, Gesture Interfaces – The Pinch Glove, The 5DT Data Glove, The Cyber glove.	

UNIT – III	08 Hours
Output Devices: Graphic Displays The human visual system, Personal Graphics Displays, Sound Displays The human auditory system, Haptic Feedback – The Human Haptic System, Tactile Feedback Interfaces, Force Feedback Interfaces. Programming with Unity: Unity Basics, Manipulating the Scene, Code blocks and Methods, Debugging Conditional and looping statements. Working with objects, Working with Scripts, Player movement, Camera Movement Further Learning for Unity: The Asset Store	

UNIT – IV	08 Hours
Computing Architectures for VR: The Rendering Pipeline – The Graphics Rendering Pipeline, The Haptics Rendering Pipeline Modeling: Geometric Modeling – Visual Object Shape, Object Visual Appearance; Kinematics Modeling – Homogeneous Transformation Matrices, Object Position; Physical Modeling – Collision Detection, Surface Deformation, Force Smoothing and Mapping, Haptic Texturing; Behavior Modeling; Principles of touch feedback and force feedback;	

UNIT – V	08 Hours
Introduction to Augmented Reality: Definition and scope, technology and features of augmented reality, difference between AR and VR, Challenges with AR, Augmented reality methods, Mixed Reality, Applications of AR & MR Computer Vision for Augmented Reality : Marker-based tracking, Marker-less tracking	

TEXT BOOKS:

1.	Burdea, G. C. and P. Coiffet. Virtual Reality Technology, Third Edition. Wiley-IEEE Press, 2024.
2.	Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

REFERENCE BOOKS:

1.	Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2.	Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3.	“Understanding Virtual Reality”, William R. Sherman, Alan B. Craig, 2003, Morgan Kaufmann Publishers.
4.	“Augmented Reality Principles and Practice”, Dieter Schmalstieg Tobias Höllerer, 2016 Pearson Education, Inc.
5.	“Game Programming with Unity and C#”, Casey Hardman, 2020. https://doi.org/10.1007/978-1-4842-5656-5

WEB LINKS:

1.	https://www.youtube.com/watch?v=HRzobEK03mY
2.	https://www.youtube.com/watch?v=h3rKvsFTfPA
3.	https://www.youtube.com/watch?v=zLMgdYI82IE
4.	https://www.youtube.com/watch?v=Nq3mPFgpREE
5.	https://freevideolectures.com/course/3693/virtual-reality
6.	https://docs.unity3d.com/Manual/index.html
7.	https://youtu.be/XLP4YTpUpBI

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Apply Virtual Reality concepts and its implications.
CO2.	Illustrate the Input-Output interactions in Virtual Reality
CO3.	Utilize UNITY tool to build applications.
CO4.	Illustrate the role of modeling in Virtual Reality
CO5.	Exemplify the Architecture of Augmented Reality

Course Articulation Matrix (Mapping between COs and POs):

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

1: Low, 2: Medium, 3: High

Rich Internet Application Development

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCCD	Course	:	

Course objectives:

This course will enable students to:

1.	To provide knowledge of rich internet technologies using modern frameworks.
2.	To understand and apply client-side scripting, AJAX, and advanced UI/UX.
3.	To develop responsive, dynamic, and interactive web applications using frameworks like Angular or React.
4.	To learn how to integrate backend services with frontend interfaces.
5.	To enable deployment and testing of web applications in real-world environments.

UNIT I

8 Hours

Introduction to Rich Internet Applications (RIA) and JavaScript Enhancements:

Definition Evolution, Architecture, RIA vs Traditional Web Applications. Modern JavaScript (ES6+): Let/Const, Arrow functions, Classes, Modules, Promises

UNIT II

8 Hours

Client-Side Frameworks and Single Page Applications (SPA): Introduction to SPA – Concepts, Routing, Lifecycle. React.js Basics – Components, Props, State, JSX, Event Handling.

UNIT III

8 Hours

AJAX, REST APIs and Asynchronous Communication: AJAX & Fetch API – XMLHttpRequest, Fetch, Axios, Error Handling. Interfacing with REST APIs – JSON, HTTP methods, Postman Testing.

UNIT IV

8 Hours

Advanced UI Development & State Management: React Advanced – Hooks (useState, useEffect), Context API. UI/UX Libraries – **Material UI** / Bootstrap, Responsive Design Techniques.

UNIT V

8 Hours

Deployment, Security and Testing of Web Applications: Deployment – Hosting on Firebase/Vercel, Build & Environment Configuration. Web Application Security & Testing – XSS, CSRF, Linting, Unit Testing with Jest.

TEXT BOOKS:

1.	Alex Banks & Eve, Learning React: <i>Modern Patterns for Developing React Apps</i> , Porcello, O'Reilly Media Edition: 2nd Edition, 2020
2.	Harwani, B.M, Rich Internet Applications with Ajax, Dreamtech Press, 2010

REFERENCE BOOKS:

1.	Frank Zammetti, Apress, Modern Full-Stack Development: <i>Using TypeScript, React, Node.js, Webpack, and Docker</i>
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WEB LINKS:

1.	https://youtu.be/BrjWObZ13AU?si=CUIH3FUfU2F2ujbt
2.	https://youtu.be/-ZO3QVgs-sk?si=wpOnaHacgL1SxOtF

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Analysis the architecture and role of Rich Internet Applications in modern web system.
CO2.	Develop a single-page applications using frameworks like React.
CO3.	Implement AJAX and Restful services for interactive client-server communication.
CO4.	Design responsive, user-friendly interfaces with advanced UI/UX techniques.
CO5.	Apply scalable rich internet applications on modern platforms

Course Articulation Matrix (Mapping between COs and POs):

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	2	2	1		1			
	CO2	2	2	1		1			
	CO3	2	2	1		1			
	CO4	2	2	1		1			
	CO5	2	2	1		1			

1: Low, 2: Medium, 3: High

Specialization D (Allied courses)

Software Testing

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCDA	Course	:	

Course Objectives:

This Course will enable students to:	
1.	Realize the principles of testing and need for testing
2.	Analyze various testing techniques and testing levels
3.	Gain knowledge on object oriented testing and fault based testing
4.	Prepare and execute test plan, manage defects and realize the use software matrix.

UNIT – I	08 Hours
Introduction to Software testing: Introduction to testing as an engineering activity, Testing fundamentals: importance of testing Software-testing principles, Software verification and validation, psychology of testing, the tester's role in a software development organization, Test design Techniques: Static testing- review, walkthrough, inspection testing types and techniques. Dynamic testing: Black box testing - boundary value analysis, equivalence partitioning (weak, strong and strong robust)	

UNIT – II	08Hours
Test design techniques: Dynamic testing- Black box testing: state transition, combinatorial testing types- decision table, cause effect graphing, White box testing: basis path testing, flow graph notation, cyclomatic complexity, code coverage testing: statement, condition, data flow, and branch.	

UNIT – III	08 Hours
Levels of testing: Unit Test, Integration tests - big-bang, top-down, bottom-up, sandwich; System Test; Regression Testing; Alpha, Beta and Acceptance Tests; Performance testing: load, stress, stability, scalability; Web testing: Introduction to web testing, web testing checklist.	

UNIT – IV	08 Hours
Object-Oriented Testing: Issues in Testing Object-Oriented Software, Object-Oriented Unit Testing, Object-Oriented Integration Testing, Object-Oriented System Testing. Fault based testing: Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis.	

UNIT – V	08 Hours
Test Plan: Importance of Test Plan , steps to create a test plan Test Execution: Test Execution Process, Ways to Perform Test Execution, Test Execution Priorities, Test Execution States, Test Execution Report. Defect/Bug Life Cycle in Software Testing, Bug Report in Software Testing, Software Testing Metrics	

TEXT BOOKS	
1	Dorothy Graham , Rex Black , Erik van Veenendaal, Foundations of Software Testing: ISTQB Certification Paperback 2020, 4 th Edition, Cengage Learning India Pvt. Ltd.
2	Paul C. Jorgensen , Byron DeVries, SOFTWARE TESTING : A CRAFTSMAN'S APPROACH Paperback –2021
3	Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012

REFERENCE BOOKS:

1.	Kshirasagara Naik, Priyadarshi Tripathy: Software Testing and Quality Assurance, Wiley India 2012
2.	M.G.Limaye: Software Testing-Principles, Techniques and Tools – McGraw Hill, 2009
2.	Adithya P.Mathur “ Foundations of Software Testing – Fundamental Algorithms and Techniques”, Pearson Education India, 2011
3.	Foundations of Software Testing ISTQB certification (Level I) by Dorothy graham, Erik van veenendaal, Rex black, Publisher : Cengage Publications, 3rd edition, 2015
4.	Ilene Burnstein, “Practical Software Testing”, Springer international edition. Publisher : Springer; 1 st edition , 2003

WEB LINKS:

1.	https://www.coursera.org/specializations/software-testing-automation
2.	https://www.udemy.com/course/everything-for-software-tester/
3.	https://www.udacity.com/course/software-testing--cs258
4.	https://www.greatlearning.in/academy/learn-for-free/courses/software-testing-fundamentals1
5.	https://www.guru99.com/software-testing.html
6.	https://onlinecourses.nptel.ac.in/noc19_cs71/preview
7.	https://testinginstitute.com/Free-Software-Testing-Training.php
8.	https://onlinecourses.nptel.ac.in/noc23_cs38/
9.	http://tryqa.com/what-is-software-testing/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Identify and review the importance of software testing as an engineering activity
CO2.	Apply various software test design techniques for a given problem
CO3.	Review various levels of software testing.
CO4.	Identify and review various issues of object oriented testing and fault based testing.
CO5.	Review and design test plan for a given scenario.

Course Articulation Matrix (Mapping between COs and POs):

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	2	1			1			
	CO2	2	2	1		1			
	CO3	2	2			1			
	CO4	2	2			1			
	CO5	2	2	1		1			

Big Data

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCDB	Course	:	

Course Objectives:

This Course will enable students to:	
1.	Gain knowledge of various technologies supporting Big DATA
2.	Get acquainted with Hadoop Ecosystem : YARN, MapReduce, Spark
3.	Get acquainted with HIVE and PIG

UNIT – I	08 Hours
Introduction to Big Data : Types of Data, Elements of Big Data, Careers in Big data. Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Detecting Fraudulent Activity in Insurance Sector, Use of Big Data in Retail Industry Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, and In-Memory Computing Technology for Big Data. The Hadoop Distributed Filesystem:	

UNIT – II	08 Hours
YARN: Understanding Hadoop YARN Architecture Anatomy of a YARN Application Run, Resource Requests, Application Lifespan, Building YARN Applications, YARN Compared to MapReduce 1, Scheduling in YARN, Scheduler Options, Capacity Scheduler Configuration, Fair Scheduler Configuration, Delay Scheduling, Dominant Resource Fairness. Spark: Introduction to Spark, Difference between Hadoop and Spark (internet).	

UNIT – III	08 Hours
Understanding Hadoop Ecosystem: Hadoop Ecosystem, HDFS: Architecture, Name nodes and data Nodes, MapReduce, Anatomy of a MapReduce Job Run :Job Submission, Job initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion. Failures: Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure. Shuffle and Sort: The Map Side, The Reduce Side, Configuration Tuning. Task Execution: The Task Execution Environment, Speculative Execution, Output Committers.	

UNIT – IV	08 Hours
Hive: Introducing Hive, Hive Variables, Hive Properties, Hive Queries, Data Types in Hive, Built-In Functions in Hive, Hive DDL, Creating Databases, Viewing a Database, Dropping a Database, Altering Databases, Creating Tables, Creating a Table Using the Existing Schema, Dropping Tables, Altering Tables, Using Hive DDL Statements, Data Manipulation in Hive, Loading Files into Tables, Inserting Data into Tables, Update in Hive, Delete in Hive, Using Hive DML Statements, Data Retrieval Queries, Using the SELECT Command, Using the WHERE Clause, Using the GROUP BY Clause, Using the HAVING Clause, Using the LIMIT Clause, Executing HiveQL Queries, Using JOINS in Hive, Inner Joins, Outer Joins, Cartesian Product Joins, Map-Side Joins, Joining Tables.	

UNIT – V	08 Hours
Pig :Execution Types Comparison with Databases, Pig Latin : Structure, Statements, Expressions, Types, Schemas,	

Functions, Macros. User-Defined Functions: A Filter UDF, An Eval UDF, A Load UDF. Data Processing Operators Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data. Pig in Practice: Parallelism, Anonymous Relations, Parameter Substitution/

TEXT BOOKS

1	DT Editorial Services, Big Data, Black Book: Covers Hadoop, MapReduce, Hive, YARN, Pig, R and Data Visualization, Edition, New Delhi Dreamtech, 2023, ISBN: 9789351199311
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REFERENCE BOOKS

1	V.K Jain ,Big Data and Hadoop, Khanna Book Publishing, Edition 2017, ISBN: 9789382609131.
2	Sridhar Alla, Big Data Analytics with Hadoop 3, Packt Publisher, 2018, Pages 482, ISBN 978178862884.

WEB LINKS:

1.	https://youtu.be/p0TdBqIt3fg?si=QqZ2pjf8wKV_d7OI
2.	https://youtu.be/JK2MdJAWEGc?si=oUC59wertp2FhHB-
3.	https://www.youtube.com/watch?v=nmaA5_d4E8c&authuser=1
4.	https://www.youtube.com/watch?v=b-lvmXoO0bU&authuser=1
5.	https://www.youtube.com/watch?v=cEjDR3B_3cs&authuser=1
6	https://www.youtube.com/watch?v=rr17cbPGWGA&pp=ygUZd2hhdCBpcyBISVZFK3NpbXBseSBsZWYybg%3D%3D
7.	https://www.youtube.com/watch?v=qr_awo5vz0g&pp=ygUYd2hhdCBpcyBQSUUrc2ltcGx5IGx1YXJu

Course Outcomes:

Upon successful completion of the course, Students should be able to:		
C3DB.1	:	Comprehend the basic concepts, types, and uses of Big Data and related technologies like Hadoop, cloud computing, and in-memory computing.
C3DB.2	:	Analyze Hadoop YARN architecture, scheduling, and Spark fundamentals with their differences from Hadoop.
C3DB.3	:	Analyze the Hadoop ecosystem and MapReduce architecture, and apply techniques for task execution and failure handling.
C3DB.4	:	Analyze Hive and apply HiveQL for managing databases, tables, and performing queries including joins and aggregations.
C3DB.5	:	Examine Pig Latin and its execution types, and apply Pig for data processing using operators, UDFs, and parallel execution.

Big Data ABL Activity Rules:

1. Students should form a team of not more than 3, and deliver a presentation covering Hive, Pig, Map reduce and Tableau etc.
2. Each team must submit the report of the presentation
3. No two teams are allowed to use the same database for presentation.

Course Articulation Matrix (Mapping between COs and POs):

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	2				1			
	CO2	2				1			
	CO3	2				1			
	CO4	2	1		1	1			
	CO5	2	1		1	1			

1: Low, 2: Medium, 3: High

Digital Marketing

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCDC	Course	:	

This Course will enable students to:

1.	Identify the role and importance of digital marketing in a rapidly changing business landscape
2.	Discuss the concepts of Display Advertising
3.	Discuss the concepts of Social Media Marketing
4.	Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM
5.	Get acquainted with digital marketing methodologies, tools and technologies.

UNIT – I	08 Hours
Digital Marketing, Introduction To Digital Marketing , Origin And Development Of Digital Marketing, Internet Users, Digital Marketing Strategy, The Consumer Decision Journey, Principles Of DMI's 3i Methodology, The P.O.E.M. Framework, IMC In Digital Marketing, Digital Landscape, Digital Advertising Market, Digital Marketing Plan, Ethical And Legal Framework Of Digital Marketing, Skills Required In Digital Marketing, Careers In Digital Marketing.	

UNIT – II	08 Hours
Concept Of Display Advertising, Digital Metrics, Types Of Display Ads, What Makes A Good Ad, How To Make A Good Ad, Display Plan, Targeting In Digital Marketing, Content Targeting, Placement Targeting, Remarketing, Interest Categories, Custom Intent Targeting, Geographic And Language Tagging, Demographics, CRM, Lookalike Targeting, Other Targeting Methods, Ad Scheduling, Frequency Capping, Ad Server, Ad Exchange, Challenges Faced By Display Advertising.	

UNIT – III	08 Hours
Social Media Marketing, The Social Media Model By Mckinsey, Marketing With Networks, Social Media Analytics, Social Media Tools, Google Analytics, Social Crawlytic, Social Web, Listen, Benefits Of Listening, Facebook Marketing, Introduction, Organic Marketing, Edgerank Algorithm, 3E Strategy For Organic Content, Content With Human Touch, Emotions And Content Virality, Linkedin Marketing, Introduction, Why It Is Important To Have Linkedin Presence, Linkedin Strategy, Content Strategy, Linkedin Analytics, Ad Campaign, TwitterMarketing, Twitter Building Blocks, Building A Content Strategy, Twitter Usage, Twitter Ads, Twitter Analytics	

UNIT – IV	08 Hours
Introduction To SEO, Search Engine Marketing(SEM), Web Analytics, Mobile Marketing, Online Campaign Management, Optimization, How To Organize Your Site: Hub And SpokeModel, SEO Phases, Website Audit, SEO Techniques, How Do You Measure SEO, SEO For Visibility, SEO Vs SEM, SEO Best Practices, Search Engine Result Page(SERP), On-Page Optimization, Off-Page Optimization, Types Of SEO, Techniques Of SEO, Importance Of SEO	

UNIT – V	08 Hours
Digital Analytics, Data Collection, Weblogs, Challenges With Weblogs, Key Metrics, Behaviour Analysis, Methods To Calculate Unique Visitors, Outcome Analysis, Experience Analysis, Usability Testing, A/B Testing, Multivariate Testing, Types Of Tracking Codes	

Text Books:

1.	Seema Gupta “Digital Marketing”, Mc-Graw Hill, Second Edition, 2020
2.	Ian Dodson “The Art of Digital Marketing”, Wiley publications, 2017
3.	Vandana Ahuja “Digital Marketing”, Oxford university press, 2015

Reference Books:

1.	Ryan Deiss, Russ Henneberry, “Digital Marketing For Dummies”, 2017
2.	Dave Chaffey, Fiona Ellis-Chadwick, “Digital Marketing Strategy Implementation And Practice”, Sixth Edition, Pearson, 2016
3.	Puneet Singh Bhatia, “Fundamentals Of Digital Marketing” Pearson, First Edition, 2017
4.	Tracy L Tuten, Michael R Solomon, Social Media Marketing, Sage Publications, Third Edition, 2020

Web Links:

1.	https://swayam.gov.in/explorer
2.	https://www.linkedin.com/learning/
3.	https://learndigital.withgoogle.com/digitalunlocked/
4.	https://digitalskills.fb.com/en-in/
5.	https://www.hubspot.com/digital-marketing
6.	https://www.tutorialspoint.com/digital_marketing/index.htm
7.	https://klientboost.com/seo/technical-seo/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Analyze the role and importance of digital marketing
CO2.	Identify the importance of Display Advertising
CO3.	Interpret the importance of Social Media Marketing
CO4.	Demonstrate the importance of Search Engine Optimization
CO5.	Identify the importance of Digital Analytics

Course Articulation Matrix (Mapping between COs and POs):

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	2	2			1			
	CO2	2	2			1			
	CO3	2	2			1			
	CO4	2	2			1			
	CO5	2	2			1			

Agile Software Processing

Contact Hours/Week	:	3(L)	Credits	:	03
Total Lecture Hours	:	40	CIE Marks	:	50
Total Practical Hours	:	0	SEE Marks	:	50
Course Code	:	S3MCDD	Course	:	

Course Objectives:

This Course will enable students to:					
1.	Understand the basic concepts of Agile Software Process				
2.	Gain knowledge in the area of various Agile Methodologies.				
3.	Understand the Principles of Agile Testing				

UNIT – I	08 Hours
Introduction Software is new product development –Iterative development: Risk-Driven and Client-Driven iterative planning – Time boxed iterative development – During the iteration, No changes from external stakeholders – Evolutionary and adaptive development - Evolutionary requirements analysis – Early “Top Ten” high-level requirements and skillful analysis – Evolutionary and adaptive planning –Incremental delivery – Evolutionary delivery – The most common mistake – Specific iterative and Evolutionary methods.	

UNIT – II	08 Hours
Agile and Its Significance Agile development: Classification of methods – The agile manifesto and principles – Agile project management – Embrace communication and feedback –Simple practices and project tools – Empirical Vs defined and prescriptive process – Principle-based versus Rule-Based – Sustainable discipline: The human touch – Team as a complex adaptive system – Agile hype – Specific agile methods. Motivation: The facts of change on software projects – Key motivations for iterative development – Meeting the requirements challenge iteratively – Problems with the waterfall. Evidence: Research evidence – Early historical project evidence – Standards-Body evidence – Expert and thought leader evidence – A Business case for iterative development – The historical accident of waterfall validity.	

UNIT – III	08 Hours
Agile Methodology Scrum: Method overview – Lifecycle – Work products, Roles and Practices values –Common mistakes and misunderstandings – Sample projects – Process mixtures– Adoption strategies – Fact versus fantasy –Strengths versus “Other” history.	

UNIT – IV	08 Hours
Agile Methodology: Agile – Motivation – Evidence – Scrum – Extreme Programming – Unified Process –Evo– Practice Tips.	

UNIT – V	08 Hours
Agile Practicing and Testing Practice: Project management – Environment – Requirements – Test – The agile alliances –The manifesto – Supporting the values – Agile testing: Nine principles and six concrete practices for testing on agile teams.	

Text Books:

1.	Ancy Cherian, Agile & Scrum Made Simple, Publisher: Notion Press, Inc., Genre: Computers, ISBN: 9781637141083, Edition: 2020
2.	K Amuthabala, Shantala Devi Patil, Thirumagal E, Thanuja K, Agile Software Development - An Overview, MileStone Research Publications, ISBN-9789359963372, 2023

Reference Books:

1.	Alistair Cockburn, "Agile Software Development Series", Addison-Wesley Professional, 2001.
2.	Robert C. Martin, "Agile Software Development Principles, Patterns and Practices", Prentice Hall, 2002.

Web Links:

1.	https://www.geeksforgeeks.org/software-engineering-agile-software-development/
2.	https://www.atlassian.com/agile
3.	https://www.agilealliance.org/agile101/the-agile-manifesto/
4.	https://www.cprime.com/resources/what-is-agile-what-is-scrum/
5.	https://www.digite.com/agile/agile-methodology/

Course Outcomes:

After the completion of this course, students will be able to:	
CO1.	Explore the basics of agile and its significance.
CO2.	Interpret the methodology of agile through various case studies.
CO3.	Summarize the concepts of Agile Practicing and Testing.
CO4.	Apply agile principles and values to a given situation.

Course Articulation Matrix (Mapping between COs and POs):

		Program Outcomes							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Course Outcomes	CO1	2	1			1		1	1
	CO2	2	1			1		1	1
	CO3	2	1			1		1	1
	CO4	2	1			1		1	1

1: Low, 2: Medium, 3: High