



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF SCIENCE

Effective from Academic Batch: 2024-25

Programme: Master of Science (Information Technology)

Semester: III

Course Code:

Course Title: Mobile Application Development

Course Group: Core Courses

Course Objectives:

- During theory lectures illustrations emphasizing the need for basic features of Mobile Computing and Cross Platform- the Mobile Application Development platform will be given.
- During Practical sessions, students will be required to develop Mobile Application using Dart language in Flutter.
- Student shall also develop applications with elegant user interface.
- Build Interactive applications that deal with data storage using Firebase and state management.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	--	--	4	50/20	50/20	--	--	100/40

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Cross-Platform Mobile App Development with Flutter and Dart Overview of Mobile App Development; Native vs. Cross-platform Development; Introduction to Flutter; Setting Up the Development Environment; Installing Flutter SDK; Setting up Android Studio/VS Code; Dart Programming Basics; Variables, Data Types, Functions, and Control Flow; Object-Oriented Programming Concepts in Dart; Understanding Flutter Architecture; Flutter Widgets and the Widget Tree; Stateless vs. Stateful Widgets;	15



2	Building User Interfaces (UI) in Flutter Layout Widgets; Containers, Rows, Columns, Stacks; Flex and Expanded Widgets; Working with Text, Images, and Icons; Text Styling and Customization; Adding Images and Icons to the UI; Form Handling and Input Widgets; Text Fields, Checkboxes, Radio Buttons, Dropdowns; Form Validation Techniques; Responsive UI Design; MediaQuery and LayoutBuilder; Adapting UI for Different Screen Sizes;	15
3	State Management and Navigation Understanding State Management ; Local vs. Global State; setState and Provider Package; Navigation and Routing; Navigator, Push, Pop, and Named Routes; Passing Data Between Screens; Handling Async Operations; Future and Stream in Dart; Working with APIs and Fetching Data	15
4	Advanced Features and Deployment Working with Databases; Using SQLite in Flutter; Introduction to Firebase Integration; Handling Media and Permissions; Camera, Gallery, and File Storage; Managing Permissions in Flutter; Performance Optimization Techniques; Debugging and Profiling Flutter Apps; Reducing App Size and Improving Efficiency; App Deployment; Building APKs and iOS Apps; Publishing Apps to Google Play Store and App Store;	15

Reference Books/Audio-visual Course:

1	Marco L. Napoli: Beginning Flutter: A Hands On Guide to App Development: Wrox publication: 2019.
2	Eric Windmill: Flutter in Action: Edition: Manning Publication: January 2020.
3	Alessandro Biessek: Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2: Packt publication: September 2019.

Supplementary learning Material:

1	https://docs.flutter.dev/reference/tutorials
2	https://www.tutorialspoint.com/flutter/index.htm
3	https://www.javatpoint.com/flutter
4	https://fluttertutorial.in/

Pedagogy:

- Justify all the topics unit-wise
- Assignments / Quiz / Presentation / Participation for continuous evaluation and assessment
- Internal / External Examination as per the norms of CVM University

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
20	40	15	15	5	5	



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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Upon successful completion of the course, students will be, able to clear all object oriented programming and cross platform concepts	25
CO-2	able to learn Flutter and Dart step by step to build engaging native mobile apps for both Android and iOS .	25
CO-3	able to learn the reduce the code through native app performance, animated UI with material design and least testing	25
CO-4	able to use Firebase to authenticate the users and use the remote database.	25

Curriculum Revision:

Version:	1.0
Drafted on (Month-Year):	March-2025
Last Reviewed on (Month-Year):	April-2025
Next Review on (Month-Year):	April-2026



FACULTY OF SCIENCE	
Effective from Academic Batch:2024-25	
Programme:	Master of Science (Information Technology)
Semester:	III
Course Code:	
Course Title:	Advanced Data Structure
Course Group:	CORE COURSES
Course Objectives: 1. Introduce the fundamental concepts of data structures and their importance in computational problem solving. 2. Familiarize students with various linear data structures such as arrays, stacks, queues, and linked lists along with their operations and applications. 3. Provide a deep understanding of non-linear data structures, including trees and graphs, and explore their advanced concepts like AVL trees, traversals, and graph algorithms. 4. Equip students with knowledge of common searching, sorting, and hashing techniques, and their efficiency in handling large-scale data.	

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	--	--	4	50/20	50/20	--	--	100/40

* J: Jury; V: Viva; P:Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Data Structure: Introduction, Primitive Data Structure, Importance of Data Structure, Types of Data Structure, Primitive & Non-Primitive Data types	07
2	Linear Data Structure: Array: Definition & concept, Representation & Application, 2D & 3D arrays, Matrix representation Stack: Definition & concept, Representation, applications, Expression: Infix, prefix & postfix, Expression conversion, stack & expression, recursion Queues: Definition & concept, types, representation, applications Linked List: Definition & concepts, types, representation, applications	18

3	Nonlinear Data Structure: Trees: Definition & Concept, Representation & Application, types, Traversals Advanced Tree Concepts: AVL Tree, Balancing, Height/Weight Balancing, Rotation Graphs: Definition & Concept, Representation & Application, types, Traversals Advanced Graph Concepts: Spanning Trees, Shortest Paths, DFS/BFS.	18
4	Sorting ,Searching and Hashing Techniques: Sorting :Introduction, Types of sorting techniques: Bubble sort, Radix sort, Selection sort, Quick sort, Merge sort, Insertion sort Searching: Introduction, Linear search, Binary search, Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques	17

Reference Books:

1	An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill
2	Data Structures using C & C++ -By Ten Baum Publisher – Prentice-Hall International
3	Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
4	Fundamentals of Data Structures in C++-By Sartaj Sahani
5	Data Structures: A Pseudo-code approach with C -By Gilberg & Forouzan Publisher Thomson Learning

Supplementary learning Material:

1	https://www.javatpoint.com/data-structure-tutorial
2	https://www.tutorialspoint.com/data_structures_algorithms/index.htm
3	https://www.programiz.com/dsa/data-structure-types

Pedagogy:

- Justify all the topics unit-wise
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R	U	A	N	E	C	
20	40	15	15	5	5	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Explain the fundamental principles of data structures, including primitive and non-primitive data types, and their role in software development.	20
CO-2	Apply linear data structures (arrays, stacks, queues, linked lists) for solving various computational problems using appropriate algorithms.	30
CO-3	Implement and analyze non-linear data structures such as trees and graphs, including advanced concepts like AVL trees, rotations, and graph traversals.	30
CO-4	Utilize efficient searching, sorting, and hashing algorithms to manage and retrieve data effectively in software applications.	20

Curriculum Revision:



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FACULTY OF SCIENCE

Effective from Academic Batch:2024-25

Programme: Master of Science(Information Technology)

Semester: III

Course Code:

Course Title: Natural Language Processing

Course Group: Elective Courses– II

Course Objectives:

- To understand algorithms for the processing of linguistic information and computational properties of natural languages.
- To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
- To familiarize various NLP software libraries and data sets publicly available.
- To develop systems for various NLP problems with moderate complexity.
- To learn steps for creating Machine learning models.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	--	--	4	50/20	50/20	--	--	100/40

* J: Jury; V: Viva; P:Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to NLP: What is NLP? Why NLP is Difficult? History of NLP, Advantages of NLP, Disadvantages of NLP, Components of NLP, Applications of NLP, How to build an NLP pipeline? Phases of NLP, NLP APIs, NLP Libraries Language Modeling and Part of Speech Tagging: Unigram Language Model, Bigram, Trigram, N-gram, Advanced smoothing for language modeling, Empirical Comparison of Smoothing Techniques, Applications of Language Modeling, Natural Language Generation, Parts of Speech Tagging, Morphology, Named Entity Recognition	20



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2	Words and Word Forms: Bag of words, skip-gram, Continuous Bag-Of-Words, Embedding representations for words Lexical Semantics, Word Sense Disambiguation, Knowledge Based and Supervised Word Sense Disambiguation Text processing: Text pre-processing, challenges, tokenization, sentence segmentation, regular expressions, words, text normalization, minimum edit distance, introduction to corpora, corpora analysis.	15
3	Text Analysis, Summarization and Extraction: Text Analysis, Summarization and Extraction: Sentiment Mining, Text Classification, Text Summarization, Information Extraction, Named Entity Recognition, Relation Extraction, Question Answering in Multilingual Setting; NLP in Information Retrieval, Cross-Lingual IR	15
4	Machine Translation: Need of MT, Problems of Machine Translation, MT Approaches, Direct Machine Translations, Rule-Based Machine Translation, Knowledge Based MT System, Statistical Machine Translation (SMT), Parameter learning in SMT (IBM models) using EM), Encoder-decoder architecture, Neural Machine Translation	10

Reference Books:

1	Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition Jurafsky, David, and James H. Martin, PEARSON
2	Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana, Practical Natural Language Processing, 2020.
3	James Allen "Natural Language Understanding, 2012, 8th Edition, Pearson Publication.

Supplementary learning Material:

1	https://onlinecourses.nptel.ac.in/noc19_cs56/preview
2	https://www.tutorialspoint.com/natural_language_processing/index.htm
3	https://www.javatpoint.com/nlp

Pedagogy:

- Justify all the topics unit-wise
- Assignments / Quiz / Presentation / Participation for continuous evaluation and assessment
- Internal / External Examination as per the norms of CVM University

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand comprehend the key concepts of NLP and identify the NLP challenges and issues and Develop Language Modeling for various text corpora across the different languages	25
CO-2	Illustrate computational methods to understand language phenomena of word sense disambiguation	25
CO-3	Design and develop applications for text or information extraction/ summarization/ classification.	25
CO-4	Understand best practices, opportunities, and the roadmap for NLP from a business and product leader's perspective.	25

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	FACULTY OF SCIENCE
	Effective from Academic Batch:2024-25
Programme:	M.Sc. in Information Technology
Semester:	III
Course Code:	
Course Title:	Data Science Using Machine Learning
Course Group:	Core Courses
Course Objectives: The objective of this course is to introduce students to the fundamentals of Data Science and Machine Learning. Students will learn basic programming skills using Python or R, understand how to handle, clean, and visualize data, and build simple machine learning models. The course covers both supervised and unsupervised learning methods along with a basic introduction to deep learning concepts. Through hands-on lab exercises and a mini project, students will apply their knowledge to real-world data and gain practical experience in data analysis and model building.	

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	--	--	4	50/20	50/20	--	--	100/40

* J: Jury; V: Viva; P:Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Basics of Data Science - What is Data Science? - Applications of Data Science - Introduction to Python or R programming - How to work with data (loading and reading datasets) - Difference between Data Science, Data Analytics, and Big Data (simple overview) - Basic Data Types (int, float, string, boolean) in Python/R - Introduction to Jupyter Notebook / Google Colab for coding practice	15
2	Data Preprocessing and Visualization - Cleaning data (missing values, wrong data) - Changing data into usable form (feature scaling, encoding) - Visualizing data (graphs and charts using Matplotlib and Seaborn)	15



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	- Handling Duplicate Data - Introduction to Pandas DataFrame operations (like head(), describe()) - Basic Customization in Graphs (adding labels, titles, legends)	
3	Supervised Machine Learning - What is Machine Learning? - Types of Machine Learning (Supervised, Unsupervised) - Linear Regression - Logistic Regression - Decision Tree, Random Forest - How to check model accuracy (Confusion Matrix, Precision, Recall)	15
4	Unsupervised Learning and Basic Deep Learning - Clustering (K-Means) - Principal Component Analysis (PCA) - Introduction to Neural Networks - Overview of model deployment (simple explanation)	18

Reference Books:

1	• Python Machine Learning – Sebastian Raschke
2	• Hands-On Machine Learning – Aurélien Géron

Supplementary learning Material:

1	• "Python for Data Analysis" by Wes McKinney (Focus: Pandas, data wrangling)
2	• "Introduction to Machine Learning with Python" by Andreas Müller and Sarah Guido (Focus: Building ML models in Python)
3	• Fast.ai Practical Deep Learning Course – https://course.fast.ai/

Pedagogy:

- Justify all the topics unit-wise - Assignments / Quiz / Presentation / Participation for continuous evaluation and assessment - Internal / External Examination as per the norms of CVM University
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
20	40	15	15	5	5	

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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
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CO-1	Understand the fundamentals of Data Science, data handling, basic programming (Python/R), and data operations.	25
CO-2	Perform data preprocessing (cleaning, feature scaling, encoding) and visualize datasets effectively using tools like Matplotlib, Seaborn, and Pandas.	25
CO-3	Apply supervised machine learning algorithms (Linear Regression, Logistic Regression, Decision Tree, Random Forest) and evaluate model performance.	25
CO-4	Implement unsupervised learning methods (Clustering, PCA) and gain introductory knowledge about Deep Learning and model deployment.	25

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FACULTY OF SCIENCE

Effective from Academic Batch: 2024-25

Programme: Master of Science (Information Technology)

Semester: III

Course Code:

Course Title: Practical Based on Mobile Application Development

Course Group: Core Course

Course Objectives:

- Understand the Flutter Framework & Dart Programming Language - Learn Dart syntax, control structures, functions, and OOP concepts; - Understand Flutter architecture and widget-based UI design
- Design and Build Interactive User Interfaces - Use built-in and custom widgets to build visually appealing UI; - Implement layout structures using Rows, Columns, Stacks, and Lists - Explore various state management techniques (setState, Provider, Riverpod, etc.)
- Understand backend integration (with Firebase): - Connect Flutter apps with Firebase for authentication, database, and storage; - Work with REST APIs and JSON data;
- Learn How to Test, debug, and publish Flutter apps to Google Play Store and Apple App Store – Also Build Real-Time Applications

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
--	--	6	3	--	--	50/20	50/20	100/40

* J: Jury; V: Viva; P: Practical

List of Practical:

Below mentioned problem definitions are for basic practice. More problem definitions will be assigned for practice during theory / practical / tutorial sessions. Students should maintain records for all the problem definitions either in digital or hard-copy format.

1.	Install Flutter & Dart, set up environment, run a simple app
2.	Write a simple program to print "Hello, Dart!"
3.	Declare and use different types: int, double, String, bool, var, dynamic.
4.	Take user input and display a response (using stdin and stdout)
5.	Perform addition, subtraction, multiplication, division, and modulus on two numbers.
6.	Write a program to check whether a number is even or odd, positive or negative.
7.	Build a calculator using user choice and switch statements.



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8.	Print multiplication table using for, while, and do-while loops.
9.	Perform add, remove, sort, and search operations on lists and sets. Create a map (dictionary), update key-value pairs, and iterate through it.
10.	Create named and anonymous functions. Use optional and named parameters.
11.	Define a class Student, create objects, and access its properties and methods.
12.	Create a base class Person and derive Employee class. (Inheritance), Implement an abstract class and an interface with multiple classes. (Abstract Classes and Interfaces), Use try, catch, on, finally to handle exceptions.
13.	Build a simple quiz in the console with score calculation and correct answers.
14.	Create a basic Flutter app with a “Hello World” message.
15.	Design a layout using Container, Row, Column, Padding, Center. (UI Layouts using Containers)
16.	Create a personal business card UI with an image and contact info (Business Card App)
17.	Implement navigation using Navigator.push() and Navigator.pop() (Navigation Between Screens)
18.	Build a form with TextField, Dropdown, Checkbox, and validate input.(User Input Form)
19.	Add and remove tasks, mark them as completed using stateful widgets. (To-Do List App)
20.	Take height and weight input, calculate BMI, and show results. (BMI Calculator App)
21.	Create a quiz with multiple questions and a scoring system. (Quiz App)
22.	Design both login and signup screens with form validation. (Login & Registration UI)
23.	Implement state management using the Provider package. (Counter App using Provider)
24.	Fetch and display weather data based on city name input. (Weather App (Using OpenWeatherMap API))
25.	Store, display, update, and delete notes locally using sqflite. (Notes App with SQLite)
26.	Register, log in, and log out using Firebase Email/Password Auth. (Firebase Authentication App)
27.	Create a simple inventory manager using Firebase Cloud Firestore. (Firestore CRUD App)
28.	Test, debug, and publish Flutter apps to Google Play Store and Apple App Store
29.	Build Real-Time Applications to Perform CRUD Operations
30.	Build Real-Time Applications to Perform CRUD Operations

Reference Books:

1	Dart for Absolute Beginners(Apress,2014)
2	Beginning Flutter: A Hands on Guide to App Development, Marco L. Napoli, Wrox- Programmer to Programmer.
3	Thomas Bailey, Alessandro Biessek - Flutter for Beginners_ An introductory guide to building cross-platform mobile applications with Flutter 2.5 and Dart-Packt Publishing (2021)

Supplementary learning Material:

1	https://docs.flutter.dev/
2	https://dartpad.dev/
3	https://www.kodeco.com/flutter
4	https://www.youtube.com/watch?v=x0uinJvhNxI
5	https://www.geeksforgeeks.org/flutter-tutorial/

Pedagogy:

- Explain / justify all the Program Definitions and correlate to real world problems and solution



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- Assignments / Quiz / Presentation / Participation for continuous evaluation and assessment
- Internal / External Examination as per the norms of CVM University

Suggested Specification table with Marks (Practical) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
5	15	20	10	20	30	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the fundamentals of Flutter and Dart programming language	25
CO-2	Design and build user interfaces using Flutter widgets and layouts; Implement navigation and multi-screen app structures	25
CO-3	Manage application state effectively and Integrate Flutter apps with backend services and databases	25
CO-4	Handle user input and data validation through forms and Deploy Flutter apps to Android / iOS platforms	25

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FACULTY OF SCIENCE	
Effective from Academic Batch:2024-25	
Programme:	Master of Science (Information Technology)
Semester:	III
Course Code:	
Course Title:	Practical Based on Advanced Data Structure
Course Group:	CORE COURSES
Course Objectives: 1. To provide practical exposure to various linear and non-linear data structures and their real-time implementations. 2. To develop skills in implementing arrays, stacks, queues, linked lists, and recursion through hands-on exercises. 3. To design and implement advanced tree and graph structures such as AVL Trees, Graph Traversals, and Spanning Trees. 4. To analyze and compare different sorting, searching, and hashing techniques based on performance through experiments.	

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
--	--	6	3	--	--	50/20	50/20	100/40

* J: Jury; V: Viva; P:Practical

List of Practical:

Implement all the Programs in C / C++:

Below mentioned problem definitions are for basic practice. More problem definitions will be assigned for practice during theory / practical / tutorial sessions. Students should maintain records for all the problem definitions either in digital or hard-copy format.

1	Implement array operations: insertion, deletion, and searching.
2	Implement stack using arrays and perform expression conversion (Infix to Postfix).
3	Evaluate a postfix expression using a stack.
4	Implement queue and circular queue using arrays.
5	Implement singly and doubly linked list with basic operations.
6	Implement recursive functions for factorial, Fibonacci, and Tower of Hanoi.
7	Construct a binary tree and perform preorder, inorder, and postorder traversals.

8	Implement AVL Tree with insertion and required rotations.
9	Represent a graph using adjacency list and perform DFS and BFS traversal.
10	Apply Dijkstra's algorithm to find the shortest path in a weighted graph.
11	Implement sorting algorithms: Quick sort and Merge sort.
12	Implement hashing with linear probing and quadratic probing .
Reference Books:	
1	An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill
2	Data Structures using C & C++ -By Ten Baum Publisher – Prentice-Hall International
3	Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
4	Fundamentals of Data Structures in C++-By Sartaj Sahani
5	Data Structures: A Pseudo-code approach with C -By Gilberg & Forouzan Publisher Thomson Learning
Supplementary learning Material:	
1	https://www.javatpoint.com/data-structure-tutorial
2	https://www.tutorialspoint.com/data_structures_algorithms/index.htm
3	https://www.programiz.com/dsa/data-structure-types
Pedagogy:	
- Explain / justify all the Program Definitions and correlate to real world problems and solution - Assignments / Quiz / Presentation / Participation for continuous evaluation and assessment - Internal / External Examination as per the norms of CVM University	

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5	15	20	10	20	30	

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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Implement and demonstrate operations on linear data structures such as arrays, stacks, queues, and linked lists using code-based practice.	25
CO-2	Develop and test recursive functions and expression conversions (infix, prefix, postfix) using stack applications.	25
CO-3	Design and implement non-linear data structures including trees (BST, AVL), and graphs with real-time traversal and optimization techniques (DFS, BFS, shortest path).	25
CO-4	Apply and evaluate sorting (Quick, Merge, Radix, etc.), searching (Linear, Binary), and hashing techniques (with collision resolution) for efficient data access and manipulation.	25

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FACULTY OF SCIENCE

Effective from Academic Batch: 2024-25

Programme: Master of Science (Information Technology)

Semester: III

Course Code:

Course Title: Practical Based on Data Science Using Machine Learning

Course Group:

Course Objectives:

- The objective of the **Fundamentals of MySQL (Practical)** course is to equip students with a solid foundation in database concepts and hands-on skills in using MySQL for data management. Students will learn to create and manage databases and tables, write and execute SQL queries for data manipulation and retrieval, apply functions and operators, and work with joins and subqueries to handle complex data relationships. The course emphasizes practical problem-solving through real-world scenarios, encouraging the use of MySQL tools like the command-line interface and MySQL Workbench. By the end of the course, students will be confident in applying MySQL skills to academic projects or beginner-level roles in database-related fields.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Interna	Externa	Interna	Externa	
--	--	2	4	-	-			

* J: Jury; V: Viva; P: Practical

List of Practicals / Tutorials:

1	Practicals based on Data Types Practice
2	Practicals based on Load and Explore Dataset
3	Practicals based on Compare Data Science, Analytics, and Big Data
4	Practicals based on Simple Data Access
5	Practicals based on Handling Missing Values
6	Practicals based on Data Encoding
7	Practical based on Feature Scaling



8	Practicals based on Visualize Data
9	Practicals based on Customize Graphs
10	Practicals based on Handle Duplicate Entries
11	Practicals based on Simple Linear Regression
12	Practicals based on Logistic Regression
13	Practicals based on K-Means Clustering
14	Practicals based on Basic Neural Network
15	Practicals based on Principal Component Analysis (PCA)

Reference Books:

1	Python Machine Learning Sebastian Raschka, Vahid Mirjalili
2	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow Aurélien Géron
3	"Learning MySQL" by Seyed Tahaghoghi and Hugh Williams Publisher: O'Reilly Media
4	Introduction to Machine Learning with Python Andreas C. Müller, Sarah Guido
5	Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courville

Supplementary learning Material:

1	" Cisco Networking Academy https://www.netacad.com/
2	NPTEL Online Courses https://nptel.ac.in/
3	Coursera – Machine Learning and Data Science Courses https://www.coursera.org/
4	Kaggle Learn https://www.kaggle.com/learn
5	DataCamp https://www.datacamp.com/

Pedagogy:

- Lab sessions
- Multiple Choice Quiz
- Internal Examination
- Demonstration examples
- Practice definitions
- Journal writing

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
25	25	15	15	10	10	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
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CO-1	Understand the fundamentals of Data Science, basic Python/R programming, data types, and dataset handling techniques.	10
CO-2	Perform effective data preprocessing, including cleaning, transformation, feature scaling, encoding, and visualize data using libraries like Pandas, Matplotlib, and Seaborn.	35
CO-3	Apply supervised machine learning techniques (Linear Regression, Logistic Regression, Decision Trees, Random Forest) and evaluate model performance using appropriate metrics.	40
CO-4	Implement unsupervised learning techniques (Clustering, PCA) and gain introductory knowledge of deep learning concepts and model deployment strategies.	25

Curriculum Revision:

Version:	1.0
Drafted on (Month-Year):	March-2025
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Next Review on (Month-Year):	



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UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF SCIENCE

Effective from Academic Batch:2024-25

Programme: Master of Science(Information Technology)

Semester: III

Course Code:

Course Title: Cloud Computing

Course Group: Elective Courses- II

Course Objectives:

- This course will provide an opportunity to study the new area of cloud computing, its infrastructure, architecture and services and provide an insight into the various delivery models and service providers.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	--	--	4	50/20	50/20	--	--	100/40

* J: Jury; V: Viva; P:Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Cloud Computing: Characteristics of Cloud Computing; Cloud Service Models Infrastructure as a Service, Platform as a Service, Software as a Service and Anything as a Service; Cloud Deployment Models Hybrid Cloud ; Difference Between Traditional Computing and Cloud Computing ; Virtualization; Need of Virtualization; Types of Virtualization ; Virtualization in Cloud Computing	10
2	Cloud Infrastructure and Architectures: Cloud Computing Stack ; Composability ; Infrastructure ; Platforms ; Virtual Applications ; Communication Protocols ; Applications; Cloud Data Center Architecture 2.3 Conceptual View of Networking in Cloud Computing; (Overview of SAN, DFS, etc.) ; Computing Cluster in Cloud ;Service Level Agreement and Cloud Pricing Model ; Cloud Security Concepts; Industrial Platforms and New Developments: Amazon Web Services, Google App Engine, Microsoft Azure	17
3	Service Offerings by Cloud Providers; Introduction to Amazon Cloud Services ;EC2 Cloud Compute ;Elastic Container Service ; Elastic Kubernetes Service ; Lambda Computing ; VPC – Virtual Private Cloud ; S3 Storage ; RDS – Relational Database Service ; ; Introduction to Microsoft Azure ; Service Fabric ; AKS – Azure Kubernetes Service ; Container Instances ; Azure SQL ; Azure DevOps ;Security Center ; Azure IoT Hub ; Traffic Manager ; Co Services ; Google App Engine ; Google Compute Engine ; Google Kubernetes Engine ; Cloud ; Cloud SQ	18



4	Cloud Delivery Model Considerations: Cloud Delivery Models: The Cloud Provider Perspective, The Cloud Consumer Perspective, Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines	15
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Reference Books:

1	Cloud Computing and Virtualization by Dac Chatterjee, WILEY, 2018
2	Cloud Computing : A Practical Approach by Anthony Velte, Toby Velte, Robert Elsenpeter, Mc Graw Hill, 2017
3	Cloud Computing – Black Book by Kailash Jayaswal, Jagannath kallakurchi, Donald Houde, Deven Shah, Dreamtech Press, 2014
4	Architecting The Cloud by Michael Kavis, WILEY, 2014
5	Google Cloud Platform Cookbook by Legorie Rajan, Packt Publication, 2018
6	Building Your Next Big Thing with Google Cloud Platform by S.P.T. Krishnan, Jose L. Ugia Gonzalez, Apress, 2015
7	Learning AWS by Aurobindo Sarkar, Amit Shah, Packt Publication, 2015

Supplementary learning Material:

1	coursera.org/learn/introduction
2	https://onlinecourses.nptel.ac.in/noc22_cs20/preview
3	https://www.tutorialspoint.com/cloud_computing/index.htm

Pedagogy:

- Justify all the topics unit-wise
- Assignments / Quiz / Presentation / Participation for continuous evaluation and assessment
- Internal / External Examination as per the norms of CVM University

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
20	40	15	15	5	5	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students will learn basics of cloud computing, types of cloud computing difference between traditional and cloud computing.	25
CO-2	The students will be familiar with various cloud infrastructures, architectures and services.	25
CO-3	They will get the knowledge of various services offering by cloud providers.	25
CO-4	Students will get various business aspects of cloud delivery models considerations.	25

Curriculum Revision:

Version:	1.0
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Next Review on (Month-Year):	April-2026

FACULTY OF SCIENCE

Effective from Academic Batch: 2024-25

Programme: Master of Science (Information Technology)

Semester: III

Course Code:

Course Title: Cyber Security

Course Group: Elective Courses

Course Objectives:

- Cyber security is critical because it helps to protect organizations and individuals from cyber-attacks. Cyber security can help to prevent data breaches, identity theft, and other types of cybercrime.
- Organizations must have strong cyber security measures to protect their data and customers.
- Cyber security is the protection of internet-connected systems such as hardware, software and data from cyber threats.
- The practice is used by individuals and enterprises to protect against unauthorized access to data centers and other computerized systems.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	--	--	4	50/20	50/20	--	--	100/40

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Cyber Security: Introduction and concept, Issues and challenges of cyber security, Definition: Cyberspace, Architecture of Cyberspace, Regulation of Cyberspace, Cyber security terminology, Cyberspace attack, Protection of end user machine	15
2	Cyber Crime: Classification of cyber crimes, Common cyber crimes, Cyber crime targeting computers and mobiles, financial frauds, Social engineering attacks, malware and ransomware attacks, zero day and zero click attacks.	15



3	Data Privacy and Data Security: Definition: Data, meta-data, big data, and non-personal data, Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA), Social media- data privacy and security issues.	15
4	Social Media Security: Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media	15

Reference Books/Audio-visual Course:

1	Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010.
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3	Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
4	Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
5	Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
6	Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
7	Fundamentals of Network Security by E. Maiwald, McGraw Hill.

Supplementary learning Material:

1	https://nptel.ac.in/courses/106105031
2	https://nptel.ac.in/courses/106106129

Pedagogy:

- Interactive Lecture Sessions
- Assignments / Quiz / Presentations / Participation for continuous evaluation and assessment
- Internal / External Examination as per the norms of CVM University

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
20	40	15	15	5	5	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
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CO-1	Understand the concept of cyber security, Cyber space and basic terminology.	25
CO-2	Understanding classification of cybercrimes and different attacks.	25
CO-3	Understanding the concept of data privacy and its policy.	25
CO-4	Evaluate Use case based on social media security.	25

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FACULTY OF SCIENCE

Effective from Academic Batch:2024-25

Programme: M.Sc. In Information Technology

Semester: III

Course Code:

Course Title: Big Data Analytics

Course Group: Elective Courses– II

Course Objectives:

- To introduce the basic concepts and characteristics of Big Data and its significance in business and research.
- To familiarize students with the Hadoop ecosystem and its core components like HDFS and MapReduce.
- To enable students to perform data analysis using Big Data tools such as Hive, Pig, and Apache Spark.
- To develop the ability to apply Big Data techniques to solve real-world problems and address issues of data security and ethics.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	--	--	4	50/20	50/20	--	--	100/40

* J: Jury; V: Viva; P:Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Big Data and Analytics • Overview of Big Data: Definition, characteristics (5 Vs: Volume, Velocity, Variety, Veracity, Value), and significance. • Types of Digital Data: Structured, semi-structured, and unstructured data. • Big Data Architecture: Components and layers involved in big data systems. • Big Data Applications: Use cases across various industries. • Challenges in Big Data: Storage, processing, and analysis issues.	15
2	Big Data Technologies • Hadoop Ecosystem: Introduction to Hadoop, its components (HDFS, MapReduce), and functionalities. • HDFS (Hadoop Distributed File System): Architecture, storage mechanisms, and fault tolerance. • MapReduce Framework: Programming model for large datasets. • NoSQL Databases: Introduction to non-relational databases for big data.	15



	Data Ingestion Tools: Overview of Flume and Sqoop.	
3	Data Processing and Analysis - Data Processing Techniques: Batch vs. real-time processing, stream processing concepts. - Data Analysis Tools: Hive, Pig, and Spark for querying and analysis. - Machine Learning Basics: Supervised and unsupervised learning. - Data Visualization: Techniques and tools for visual insights	15
4	Advanced Topics and Case Studies - Big Data Security and Privacy: Challenges and solutions. - Ethical Considerations: Data privacy laws, ethical usage. - Case Studies: Big data applications in healthcare, finance, and retail. - Emerging Trends: Latest advancements and future directions.	18

Reference Books:

1	Python Machine Learning – Sebastian Raschka <i>Focus: Core machine learning techniques using Python.</i>
2	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow – Aurélien Géron <i>Focus: Practical applications of machine learning and deep learning.</i>

Supplementary learning Material:

1	Python for Data Analysis – Wes McKinney
2	Introduction to Machine Learning with Python – Andreas C. Müller & Sarah Guido
3	Fast.ai – Practical Deep Learning for Coders (Free Course) https://course.fast.ai/

Pedagogy:

- Justify all the topics unit-wise - Assignments / Quiz / Presentation / Participation for continuous evaluation and assessment - Internal / External Examination as per the norms of CVM University
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
20	40	15	15	5	5	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the fundamental concepts of big data, its architecture, and the challenges associated with managing large-scale data. (Knowledge level: Understanding)	25
CO-2	Apply big data technologies like Hadoop, HDFS, and MapReduce to store and process large datasets efficiently. (Knowledge level: Applying)	25
CO-3	Analyze large datasets using tools such as Hive, Pig, and Spark to derive meaningful insights and patterns. (Knowledge level: Analyzing)	25
CO-4	Evaluate big data solutions in real-world applications and assess privacy, ethical, and security concerns in data analytics. (Knowledge level: Evaluating)	25



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