SEMESTER-I

Course Plan

Course Title: Database Management Systems	
Course Code : 25MCA1L101	**Semester: I**
Teaching Scheme:L-T-P:3-0-0	**Credits:3**
Evaluation Scheme: ISE+MSE Marks:20+30	**ESE Marks : 50**

Course Description:

This course introduces the fundamental concepts of Database Management Systems (DBMS), including relational database design, SQL, and transaction processing. It progresses toward modern data management by introducing NoSQL databases and practical usage of MongoDB. The course bridges classical database theory with real-world applications, enabling students to work effectively with both relational and non-relational databases.

Course Objectives:

- To understand the fundamental principles and architecture of DBMS.
- To explore data models and the relational approach to database design.
- To apply normalization and design relational schemas using dependency theory.
- To understand transaction management, concurrency control, and recovery techniques.
- To introduce the concept of NoSQL databases and their applicability to modern applications.
- To gain hands-on experience with MongoDB and understand differences between RDBMS and NoSQL systems.

Course Outcomes (COs):

	Course Outcome (CO)
CO1	Understand the basic concepts & fundamentals of DBMS
CO2	Apply data modelling concepts using ER diagrams and map them to relational schemas.
CO3	Analyse and apply normalization techniques and functional dependencies to design efficient relational databases.
CO4	Understand principles of transaction management, concurrency control, and recovery mechanisms in DBMS.
CO5	Identify need for NoSQL databases and its types.
CO6	Demonstrate use of MongoDB for document-based storage, CRUD operations, and indexing.

Pre-requisite:	Basic understanding of data structures, computer organization, and programming concepts.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	2	3	-	1	-	3	1	2	1	1	1	1	1	1	2	1, 2
2	2	2	2	2	1	-	-	3	1	3	3	1	1	3	2	2
3	2	3	2	2	1	-	-	3	1	3	3	1	1	3	2	3
4	2	3	2	3	1	3	3	3	1	3	3	1	2	3	2	3
5	1	3	3	3	3	3	3	3	1	3	3	3	2	3	3	3
6	2	2	2	3	3	3	3	3	1	3	3	3	2	3	3	3

Content	Hours
Unit 1: Introduction to DBMS 1.1 Data vs Information 1.2 Data Processing & Management 1.3 File-based vs Database approach 1.4 Characteristics and advantages of DBMS 1.5 Architecture of DBMS (3-tier) 1.6 Database users and roles 1.7 Data Independence	7
Unit 2: Data Models and Relational Concepts 2.1 Data Models: Hierarchical, Network, Relational 2.2 Relational Model Concepts: Attributes (Types of attributes), Tuples, Relations 2.3 Keys (Primary, Foreign, Candidate) 2.4 Entity-Relationship Model 2.5 Mapping ER to Relational model 2.6 Extended or enhanced ER Model-Specialization, Generalization & Aggregation 2.7 SQL a. SQL: DDL, DML, DCL, TCL b. Joins, Subqueries, Grouping c. Views and Indexing	8
Unit 3: Relational Database Design 3.1 Functional Dependencies and Normalization for Relational Databases 3.2 Informal Design Guidelines for Relation Schemas 3.3 Functional Dependencies 3.4 Normal Forms Based on Primary Keys: 1NF, 2NF, 3NF, and BCNF 3.5 Lossless Join and Dependency-Preserving Decomposition	7
Unit IV – Transactions, Concurrency Control, Recovery Techniques 4.1 Basic Concepts 4.2 ACID Properties of Transactions 4.3 Transaction States 4.4 Implementation of Atomicity and Durability 4.5 Concurrent Executions 4.6 Basic Idea of Serializability	9

a. View Serializability b. Conflict Serializability 4.7 Recovery Techniques: a. Failure Classification b. Storage Structure c. Recovery and Atomicity d. Log-Based Recovery e. Shadow Paging f. Deferred Database Modification g. Immediate Database Modification h. Checkpoints	
Unit 5: Introduction to NoSQL Databases 5.1 Introduction to NoSQL: Definition, Need, and Features 5.2 Types of NoSQL databases: a. Key-Value Stores b. Document Stores (e.g., MongoDB) c. Column-Oriented Stores d. Graph Databases 5.3 CAP Theorem	7
Unit 6: Working with MongoDB 6.1 MongoDB basics: Collections, Documents 6.2 CRUD operations using MongoDB Shell 6.3 Schema design in MongoDB 6.4 Indexing and Aggregation 6.5 Comparison: RDBMS vs NoSQL	7

Reference books:

1. Database System Concepts – Abraham Silberschatz, Henry F. Korth, S. Sudarshan
2. Fundamentals of Database Systems – Ramez Elmasri, Shamkant B. Navathe
3. An Introduction to Database Systems – C.J. Date
4. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence – Pramod J. Sadalage, Martin Fowler
5. MongoDB: The Definitive Guide – Kristina Chodorow

Online References:

Sr. No.	Website Address
1	https://www.geeksforgeeks.org/dbms/ - DBMS concepts and practice questions
2	https://www.tutorialspoint.com/dbms - DBMS tutorials
3	https://www.w3schools.com/sql/ - SQL syntax, examples, and exercises
4	https://www.mongodb.com/docs/manual/ - Official MongoDB documentation
5	https://learn.mongodb.com/ -MongoDB University – Free interactive courses
6	https://www.studytonight.com/dbms - Theory with DBMS quizzes and ER tools

Evaluation Scheme:

Assessment	Total Marks	Intended course learning outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
ISE	**20**	√	√	√	√	√	√
MSE	**30**	√	√	√			
ESE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE
(Minimum 3 and Max. 5 tools)

Formative Assessment Tools/Methods	Total Marks	Course Learning Outcomes to be assessed *(Please tick as appropriate)*					
		CO1	CO2	CO3	CO4	CO5	CO6
Assessment 1 – Quizzes/MCQs	**20**	√			√		
Assessment 2 – Assignment Submissions			√	√	√	√	√
Assessment 3 – Case Study			√	√	√		
Assessment 4 – SQL & MongoDB Lab Tasks			√			√	√
Assessment 5 – Presentations/Seminars					√	√	√
Assessment 6 – Class Tests (Descriptive)		√		√	√		

Course Plan

Course Title: Data Structure	
Course Code: 25MCA1L102	**Semester: I**
Teaching Scheme:L-T-P:3-0-0	**Credits:3**
Evaluation Scheme: ISE+MSE Marks:20+30	**ESE Marks: 50**

Course Description:

The course is designed to develop skills to design and analyse simple linear and nonlinear data structures. It strengthens the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures

Course Objectives:

- To understand the foundational concepts of data structures
- To develop proficiency in using linear data structures such as stack and queues
- To understand and implement and manipulate various types of linked lists
- To explore non-linear data structures as tree and their operations
- To examine graph theory concepts and its different traversal techniques
- To implement and analyze various searching and sorting algorithms

Course Outcomes (COs):

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Understand the foundational concepts of data structures
CO2	Develop proficiency in using linear data structures such as stack and queues
CO3	Implement and manipulate various types of linked lists
CO4	Explore non-linear data structures, particularly tree and their operations
CO5	Examine graph theory concepts and traversal techniques
CO6	Implement and analyze various searching and sorting algorithms

Prerequisite:	Basic Knowledge of Programming Basic Mathematical Approach

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	3	2	2	2	-	-	-	1	-	-	-	-	1
3	1	1	2	2	2	-	-	-	1	-	-	-	-	1
4	1	3	1	2	1	-	-	-	1	-	-	-	-	3
5	3	3	2	3	2	-	-	-	1	-	-	-	-	1
6	3	3	3	3	2	-	-	-	-	-	-	-	-	-

Course Contents	Hours
Unit 1: Basic of Data Structures Data structure- Definition, Types of data structures, Data Structure Operations, Algorithms: Complexity, Time and Space complexity.	4
Unit 2: Stacks and Queues Stack: Definition, operations, Array representation of stack, applications Queue: Definition, operations, Array representation of queue, applications, Circular queue, Priority queue, De-queue.	7
Unit 3: Linked Lists Definition, representation, operations, implementation and applications of singly, doubly and circular linked lists. Linked representation of stack and Queue.	8
Unit 4: Trees Terminology, representation, binary tree, traversal methods, binary search tree, AVL tree (Introduction), Heaps- Operations and their applications	7
Unit 5: Graphs Basic concept of graph theory, storage representation, graph traversal techniques- BFS and DFS	6
Unit 6: Searching and Sorting Techniques Searching: Linear search, Binary search, Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Heap Sort Complexity and analysis of Searching and Sorting Algorithms	7

Text Books:

1. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH)
2. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon 2nd Edition

Reference Books:

1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Fundamentals of Data Structures - Horowitz, Sahani (CBS India)

Online References:

Sr. No.	Website Address
1	https://nptel.ac.in/courses/106102064
2	https://archive.nptel.ac.in/courses/106/106/106106127/
3	https://nptel.ac.in/courses/106105085
4	https://onlinecourses.swayam2.ac.in/cec19_cs04/preview

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE	**20**	√	√	√	√	√	√
MSE	**30**	√	√	√			
ESE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Quizzes/MCQs	**20**	√			√		
Assessment 2 – Assignment Submissions			√	√	√	√	√
Assessment 3 – Case Study			√	√	√		
Assessment 4 – Quiz			√			√	√
Assessment 5 – Presentations/Seminars					√	√	√
Assessment 6 – Class Tests (Descriptive)		√		√	√		

Course Plan

Course Title: Object Oriented Software Engineering	
Course Code: 25MCA1L103	**Semester: I**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

This course provides a comprehensive introduction to the principles and practices of Object-Oriented Software Engineering (OOSE). Building on traditional software engineering foundations, it focuses on object-oriented approaches to software analysis, design, and modeling. Students will learn to apply the Unified Modeling Language (UML) for designing modern software systems and understand object-oriented design principles and patterns. The course bridges the gap between problem specification and software implementation through use-case driven development, UML diagrams, and best design practices.

Course Objectives:

- Understand the fundamentals of software engineering processes and lifecycle models.
- Learn and apply the principles of object-oriented software engineering.
- Gain proficiency in creating models of software systems using UML.
- Analyze and model both the static and dynamic behaviour of systems.
- Apply object-oriented design principles for effective system design.
- Explore foundational design patterns to promote reuse and scalability.

Course Outcomes (COs):

After successful completion of this course, students will be able to:

CO1	Understand fundamental concepts, principles, and challenges of software engineering.
CO2	Describe SDLC models and perform requirement analysis using use-case approaches.
CO3	Understand object-oriented software engineering concepts and create basic UML models.
CO4	Develop behavioral UML diagrams such as use-case, sequence, collaboration, activity, and state diagrams.
CO5	Construct structural UML diagrams including class, object, component, package, and deployment diagrams.
CO6	Apply object-oriented design principles (SOLID) and recognize standard design patterns in software systems.

Pre-requisite:	Basic knowledge of Software Engineering, Object-Oriented Programming (preferably C++/Java), and basic UML.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	1	2	2	2	2	2	2	2	1	2	-	3	2	2	2	1, 2
2	-	2	2	2	2	-	2	2	1	2	-	-	1	2	2	2
3	1	2	1	2	2	-	2	1	-	1	-	-	1	2	2	3
4	-	2	2	2	2	-	2	2	1	2	-	-	1	2	2	3
5	-	2	2	2	2	-	2	2	1	1	-	-	1	2	2	3
6	3	2	2	2	2	-	2	3	1	2	-	-	1	2	2	3

Content	Hours
Unit 1: Introduction to Software Engineering: Characteristics of software, Software engineering vs. programming, Goals and principles of software engineering, Software development challenges, Introduction to software process and quality.	**6**
Unit 2: Software Development Life Cycle & Requirements: Software Development Life Cycle (SDLC): Waterfall, Spiral, RAD, Agile, Requirement Engineering Process, Types of Requirements: Functional and Non-functional, Elicitation Techniques: Interview, Questionnaire, Observation, Software Requirements Specification (SRS): format, qualities, Use Case-driven requirement gathering.	**6**
Unit 3: Introduction to OOSE, Modeling and UML: What is Object-Oriented Software Engineering (OOSE)?, Differences between traditional and OO approaches, Benefits of OOSE: reusability, modularity, extensibility, Introduction to modeling, Need and benefits of modeling in software development, Introduction to UML (Unified Modeling Language), History and purpose, Types of UML diagrams (structural vs behavioral), Overview of UML modeling tools (StarUML, Lucidchart, Visual Paradigm).	**7**
Unit 4: UML Behavioral Models: a. **Use Case Diagram:** Actors, Use Cases, Relationships (include, extend, generalization), Use	**9**

Case Descriptions and Scenarios b. **Activity Diagram:** Actions, Decisions, Merge, Fork/Join, Swimlanes c. **State Chart Diagram:** States, Events, Transitions, Composite and History States d. **Sequence Diagram:** Objects, Lifelines, Messages, Activation Bars e. **Collaboration (Communication) Diagram:** Link between objects, Message numbering	
Unit 5: UML Structural Models: a. **Class Diagram:** Classes, Attributes, Methods, Associations, Multiplicity, Generalization, Aggregation, Composition, Dependency b. **Object Diagram:** Instances of classes and their links c. **Component Diagram:** Software components and their dependencies d. **Deployment Diagram:** Nodes, Artifacts, Communication paths e. **Package Diagram:** Organizing UML elements and system architecture	**9**
Unit 6: Object-Oriented Design Principles and Patterns: Introduction to OO Design, Design Process: From analysis to design, SOLID Principles, Coupling and Cohesion, Design Patterns (Overview): Creational, Structural, Behavioral patterns, Examples: Singleton, Factory, Observer, MVC.	**8**

Reference books:

1. Object-Oriented Software Engineering: A Use Case Driven Approach – Ivar Jacobson
2. Software Engineering – Ian Sommerville
3. Object-Oriented Modeling and Design with UML – Michael Blaha & James Rumbaugh
4. UML Distilled: A Brief Guide to the Standard Object Modeling Language – Martin Fowler
5. Software Engineering: A Practitioner's Approach – Roger S. Pressman

Online References:

Sr. No.	Website address
1	https://www.uml-diagrams.org – UML diagrams and examples
2	https://visual-paradigm.com – UML tool with tutorials
3	https://www.geeksforgeeks.org/software-engineering – Articles on SE concepts
4	https://www.tutorialspoint.com/uml – UML tutorials

5	https://lucidchart.com – UML and modeling tool
6	https://staruml.io – UML modeling software

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE	**20**	√	√	√	√	√	√
MSE	**30**	√	√	√			
ESE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Quizzes/MCQs	**20**	√		√			
Assessment 2 – Assignment Submissions			√	√	√	√	√
Assessment 3 – Case Study			√	√	√	√	√
Assessment 4 – UML Lab Exercises				√	√	√	
Assessment 5 – Presentations/Seminars					√	√	√
Assessment 6 – Class Tests (Descriptive)		√	√	√	√		

Course Plan

Course Title: Artificial Intelligence	
Course Code: 25MCA1L104	**Semester: I**
Teaching Scheme:L-T-P:3-0-0	**Credits:3**
Evaluation Scheme : ISE+MSE Marks:20+30	**ESE Marks : 50**

Course Description:

This course provides a comprehensive introduction to Artificial Intelligence (AI), including intelligent agents, search strategies, knowledge representation, and reasoning. It also covers modern AI approaches such as neural networks, deep learning, fuzzy logic, genetic algorithms, and natural language processing. Students will learn to apply these techniques to solve real-world problems using intelligent systems.

Course Objectives:

- To introduce core concepts, history, and applications of Artificial Intelligence.
- To cover search methods, knowledge representation, and reasoning techniques.
- To explain neural networks, deep learning, and fuzzy logic systems.
- To explore genetic algorithms and natural language processing applications.

Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:

CO1	Understand the fundamentals of AI, intelligent agents, and core techniques.
CO2	Apply search strategies and game-playing algorithms for problem-solving.
CO3	Implement knowledge representation methods and inference mechanisms.
CO4	Understand the structure of neural networks and the fundamentals of deep learning techniques.
CO5	Develop fuzzy logic systems and differentiate reasoning approaches in AI.
CO6	Understand the working of genetic algorithms and the basics of NLP techniques and their applications.

Prerequisite:	Basic knowledge of computer programming, logic, and data structures.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	1	2	-	1		2	3	1	-	1	-	1	-	1	1	2
2	2	2	2	2	2		2	2	-	2	2	1	1	2	2	5
3	2	2	2	2	2	2	3	2	1	2	2	2	1	2	2	4
4	1	2	2	2	2		3	1	1	2	1	1	1	2	2	2
5	2	2	2	2	2	2	3	2	1	2	3	3	1	2	2	4
6	2	2	-	2	2	2	3	2	1	2	3	2	1	2	2	4

Content	Hours
Unit 1: Introduction to Artificial Intelligence Introduction and Definition of Artificial Intelligence, History of AI, Application of AI, Problems in Artificial Intelligence, AI Techniques. Agents and Environments: Types of agents (simple reflex, goal-based, utility-based, learning agents); Types of environments (deterministic, stochastic, static, dynamic), **AI Techniques:** Symbolic vs. Sub-symbolic approaches	5
Unit 2: Search Techniques in AI State Space Search & Heuristic Search Techniques: Defining The Problems as A State Space Search, Difference between Uninformed search and Informed search. Uninformed search: Breadth-first search, Depth-first search, Uniform-cost Search, Bidirectional search algorithm and Depth-limited search. Informed search: - A* Search, Best first search. Game Playing: - Minimax algorithm, Alpha – Beta pruning. Classic examples: Tic-Tac-Toe, Water-Jug, 8-Puzzle.	10
Unit 3: Knowledge Representation in AI Knowledge Representation: Introduction to Knowledge, Approaches To Knowledge Representation. Techniques of knowledge representation: Logical representation (Propositional Logic and Predicate logic), Semantic networks, frame representation, Production rules. Normal forms: Disjunctive normal form and Conjunctive normal form. Inference engine: Forward and Backward chaining. Ontologies & Description Logics (OWL/RDF) and knowledge Graphs & Semantic Web (RDF, SPARQL).	8

UNIT-4: - Neural Networks Basic concept of Neural Networks, Typical structure of Neural Networks. Types of Neural Networks: Feedforward Network, Recurrent Network, Convolution Neural Networks. Deep Learning: - Deep Learning in Neural Networks and its application. **Activation Functions:** Sigmoid, Tanh, ReLU, Leaky ReLU, Softmax Regularization & Generalization: - Overfitting vs. Underfitting: **Bias-variance trade-off** **Techniques:** – L1/L2 weight regularization – Dropout – Batch Normalization – Early stopping	7
UNIT-5: - Fuzzy Set and Reasoning Fuzzy set, Membership function. Fuzzy operations: Union, Intersection, Complement. Fuzzy Logic: What is fuzzy logic, characteristics of fuzzy logic, architecture of the Fuzzy Logic system. Fuzzy Inference Systems: Mamdani and Sugeno, Defuzzification Techniques and Fuzzy Rule Base Design and Examples. Reasoning: Meaning, Types: Deductive reasoning, Inductive reasoning, Abductive reasoning, Common Sense Reasoning, Monotonic Reasoning and Non-Monotonic Reasoning.	8
UNIT-6: GA and NLP **Genetic Algorithm and NLP:** Working of Genetic Algorithm, Genetic operator: Selection Operator – Roulette wheel selection, Tournament selection, Rank-based selection, Crossover Operator -One-point crossover, Two-point crossover. Mutation Operator, **Natural Language Processing:** Introduction, working, and application of NLP.	7

Text Books:

1. Artificial Intelligence, 3rd Edition, Elaine Rich, Kevin Knight, S.B. Nair - Tata McGraw Hill.
2. Artificial Intelligence: A Modern Approach Textbook by Peter Norvig and Stuart J. Russell
3. Artificial I ntelligence by Patrick Henry Winston - Addison-Wesley, Third Edition.

Reference Books :

1. Artificial Intelligence and Intelligent Systems by N.P.Padhy - Oxford University Press.
2. Neural Networks and Learning Machines, 3rd Edition – *Simon Haykin* – Pearson
3. Fuzzy Logic with Engineering Applications – *Timothy J. Ross* – Wiley

Online References:

Sr. No.	Website address
1	https://nptel.ac.in/courses/106102220
2	https://nptel.ac.in/courses/106105077
3	http://www.digimat.in/nptel/courses/video/106106126/L01.html
4	https://www.geeksforgeeks.org

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE	**20**	√	√	√	√	√	√
MSE	**30**	√	√	√			
ESE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Poster Presentation	**20**	√	√		√		
Assessment 2 – Concept Map / Diagram Drawing + Search Problem Solving		√	√	√	√		
Assessment 3 – Open Book Assignment		√				√	√
Assessment 4 – Group Presentation on AI Applications		√			√	√	√
Assessment 5 – Hands-on Lab Task (or Video Submission)			√	√	√		

Course Plan

Course Title: Computational Statistics using R	
Course Code: 25MCA1L105	**Semester :I**
TeachingScheme:L-T-P:3-0-0	**Credits:3**
Evaluation Scheme: ISE+MSE Marks:20+30	**ESE Marks : 50**

Course Description:

The course aims to aware the students about fundamentals of statistics, classification and frequency distribution. It also insists about different types of central tendency like mean, median and mode. It tries to aware the students about dispersion and its types and the concept of variance. It attempts to aware about the techniques of correlation and regression analysis. Further it attempts to aware R fundamentals, R Script, matrices, vectors, list, arrays, factors & data frames in R . It tries to implement statistical measures like mean, median, mode, dispersion, correlation and different types of charts & graphs using R.

Course Objectives:

- To build a strong foundation of statistics and basics of statistics
- To become proficient in all Statistics concepts and their Application necessary to become a data science Professional.
- To identify and study the data for analytics purpose using different types of dispersion techniques like Mean deviation & standard deviation.
- To identify and study the data to analyze correlation among different series
- To keep the students and faculty a breast with the emerging technologies like R programming in the field of computer applications.

Course Outcomes (COs):

CO1	Remember the definitions of statistical concepts
CO2	Understand the fundamentals of statistics like Mean, Median, Mode and their Application
CO3	Analyze the data for analytics purpose using different types of dispersion techniques.
CO4	Analyze the data series for correlation analysis
CO5	Understand and analyze R programming
CO6	Applying statistical techniques in practical applications using R Programming

Prerequisite:	Basic knowledge of Statistics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	**POs**												**PSOs**			**BTL**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	
1	2	2	-	-	-	-	1	-	-	-	-	-	-	-	-	1
2	2	2	-	-	-	-	1	-	-	-	-	-	-	-	-	2
3	2	2	-	-	-	-	1	-	-	-	-	-	-	-	-	4
4	2	2	-	-	-	-	1	-	-	-	-	-	-	-	-	4
5	2	2	2	2	2	-	2	-	-	2	-	-	-	-	-	2
6	2	2	2	2	2	-	2	-	-	2	-	-	-	-	-	3

Content	**Hours**
Unit 1: Introduction to Statistics: 1.1 Meaning of Statistics as a Science, Importance of Statistics, Scope of Statistics, 1.2 Types of data: Primary data, Secondary data, Cross-sectional data, time series data, 1.3 Classification: Importance of Classification, types of Classification, 1.4 Frequency distribution : Ungrouped frequency distribution, Grouped frequency distribution, Cumulative frequency distribution, Relative frequency distribution.	6
Unit 2: Measures of Central Tendency: 2.1 Concept of Central tendency of statistical data, Statistical averages, characteristics of a good statistical average. 2.2 Arithmetic Mean(A.M.): Definition, Arithmetic Mean for ungrouped and grouped data, merits and demerits9, 2.3 Median: Definition, Calculation of Median for ungrouped and grouped data, merits and demerits 2.4 Mode : Definition, Calculation of Mode for ungrouped and grouped data, merits and demerits	8

Unit 3: Measures of Dispersion 3.1 Concept of dispersion, Characteristics of good measure of dispersion, 3.2 Types: Range, Quartile deviation for ungrouped and grouped data, Mean deviation for ungrouped and grouped data , merits and demerits 3.3 Standard deviation for ungrouped and grouped data & Variance , merits and demerits	8
Unit 4: Correlation 4.1 Meaning & definition of correlation, Scatter diagram and interpretation., Concept of correlation between two variables, positive correlation, negative correlation, no correlation. 4.2 Karl Pearson's coefficient of correlation(r), Spearman's Rank correlation coefficient	6
Unit 5: Introduction to R Language 5.1 Overview & features of R, R Environment Setup, Installation of R, R Studio setup, R Script, 5.2 Data types & Variables, Operators in R, 5.3 Matrices: Creating matrices, Operations on Matrices 5.4 Vectors: Creation of vectors, operations on vectors 5.4 List: creating Lists, operations on lists 5.5. Arrays: Crating arrays, operations on array, 5.4 Factors: Creation of factors, operations on factors, attributes of a factor, Factor Levels 5.5 Data Frame : Creating data frame, subsetting data frame, modification in data frame, functions in data frame	10
Unit 6: Statistical Measures using R 6.1 R charts and graphs: Plot, Line, Scatterplot, pie chart, bar graph 6.2 Calculation of Statistical measures using R : Mean, Median, Mode, Standard deviation , Variance, Correlation	7

Text Books:

1. Fundamental of Statistics by S.C. Gupta, Himalaya Publishing House, ISO 9001 Cetified

2. Freedman, David, Robert Pisani, & Roger Pervis (2007). *Statistics.* NewYork: W.W. Norton

3.Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN: 978-93-5260-455-5.

4. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8. 3.

Reference Books:

1.James, Gareth, DanielaWitten, TrevorHastie, &RobertTibshirani(2013).*An Introduction to Statistical Learning: With Applicationsin R* .NewYork: Springer.

2. Andrie de Vries, Joris Meys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8

3. The Art of R Programming: A Tour of Statistical Software Design-Norman Matloff, No Starch Press, ISBN-10: 1593273843, ISBN-13: 978-1593273842

4.Learning R: A Step-by-Step Function Guide to Data Analysis, Richard Cotton, Orielly, ISBN-10: 593273843, ISBN-13: 978-1593273842

5. R in Action: Data Analysis and Graphics with R, Robert Kabacoff, Manning Publications, ISBN-10: 1617291382, ISBN-13: 978-1617291388

Online Resources:

Online Resources No.	Website address
1	nptel.ac.in/courses/110/107/110107114/
2	https://nptel.ac.in/courses/111105090
3	Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.

Evaluation Scheme:

Assessment	Total Marks	Intended course learning outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
ISE	20	☐	☐	☐	☐	☐	☐
MSE	30	☐	☐	☐			
ESE	50	☐	☐	☐	☐	☐	☐
Total	100						

Suggestive Formative Assessment Tools/Methods for ISE*(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Multiple Choice Based	**20**	√	√		√		√
Assessment 2 – Project based Learning				√			√
Assessment 3 – Hands on practice /		√					
Assessment 4 – Field or Desk Project / application based / Term paper or Report writing		√				√	
Assessment 5 – Any applicable assessment method to Computer Application in relevance of course outcome(s).			√		√	□	

Course Plan

Course Title: Digital Marketing	
Course Code: 25MCA1L106	**Semester: I**
Teaching Scheme:L-T-P:2-0-0	**Credits:2**
Evaluation Scheme : ISE+MSE Marks:25+25	**ESE Marks : -**

Course Description:

This course provides an in-depth understanding of Digital Marketing, covering key areas such as website development, SEO, social media, content marketing, analytics, paid advertising, and emerging AI tools. Students will explore how digital strategies differ from traditional methods, learn to optimize online presence, and use real-world tools like Google Analytics, Meta Ads, and ChatGPT to plan, execute, and analyze campaigns effectively.

Course Objectives:

1. To introduce the evolution, trends, and strategic importance of digital marketing in the modern business environment.
2. To enable students to design and manage websites, implement SEO techniques and ensure technical optimization.
3. To develop skills in content marketing, social media strategy, and performance analysis using analytics tools.
4. To explore digital advertising, email/WhatsApp marketing, automation and the role of AI in campaign execution and personalization.

Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:

CO1	Understand the evolution of digital marketing, current trends, digital vs. traditional approaches, and planning models.
CO2	Design and manage websites using CMS tools, and apply on-page, off-page, and technical SEO best practices.
CO3	Develop and execute content and social media marketing strategies using analytics tools for performance tracking.
CO4	Plan and implement paid advertising, email/WhatsApp marketing campaigns, and utilize AI tools for automation and personalization.

Prerequisite:	Basic knowledge of internet usage, computer operations, and familiarity with web browsing and social media platforms.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	-	2	1	3	-	2	3	3	1	1	1	1	1	1	2	2
2	1	2	2	3	3	-	2	2	1	2	3	-	1	1	1	5
3	-	2	2	3	2	2	3	3	1	3	1	1	1	1	2	4
4	1	2	2	3	3	2	3	3	1	3	3	1	1	1	2	2

Content	Hours
Unit 1: Introduction to Digital Marketing Introduction to Digital Marketing, Evolution of Digital Marketing from traditional to modern era, Role of Internet, Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment, Consumer behavior, marketing mix, digital vs offline channels, Digital framework and planning models (e.g., POEM, customer journey mapping) Mini case: Compare a traditional vs digital campaign	5

Unit 2: Website Management, SEO & Technical Optimization Website Fundamentals & WordPress Setup, Theme Customization & Content Management, SEO Fundamentals & Keyword Research, On-Page Optimization: Meta tags, internal linking, content integration, Technical SEO: sitemaps, robots.txt, performance, Mobile usability, Schema Markup & Security Essentials, Off-Page SEO: Backlinks, audits, link-building strategies.	7
Unit 3: Analytics, Content & Social Media Marketing Google Search Console & Analytics Setup (GA4 included), SEO Reporting & Performance Tracking, Content Marketing Funnel: TOFU, MOFU, BOFU & Copywriting tactics, Social Media Strategy: Facebook, Instagram, LinkedIn & YouTube, Social Media Management tools & content calendars, Influencer Marketing: Platforms, campaign design & metrics.	8
Unit 4: Paid Advertising, Email/WhatsApp & AI in Marketing Meta Ads basics: structure, targeting, budgeting, Campaign execution: placements, A/B testing, conversion tracking (pixel & CAPI), Google Ads: Search, Display, Video & Shopping Ads + remarketing, Email & WhatsApp Marketing: list building, content, analytics & compliance, Marketing Automation: workflows and toolsets, AI & ChatGPT Tools: content generation, ad copy & campaign personalization	6

Reference Books:

1. Seema Gupta – *Digital Marketing* (MH/McGraw-Hill)
2. Ian Dodson – *The Art of Digital Marketing*
3. GrowthAcad curriculum overview
4. On DigitalMarketing AI-integrated syllabus

Online References:

Sr. No.	Website address
1	https://learndigital.withgoogle.com/digitalgarage/course/digital-marketing
2	https://www.tutorialspoint.com/digital_marketing/index.htm?utm_source
3	https://www.scribd.com/document/718883068/CCW322-Digital-Marketing-notes-1-unit?utm_source
4	https://www.scribd.com/document/513372531/Digital-marketing-notes?utm_source

Evaluation Scheme:					
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)			
		CO1	**CO2**	**CO3**	**CO4**
ISE	**25**	√	√		
ISE	**25**			√	√
Total	**50**				

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*					
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** (Please tick as appropriate)			
		CO1	**CO2**	**CO3**	**CO4**
Assessment 1 – **Assessment 1 – Open Book Assignment** (e.g. compare traditional vs. digital campaigns, analyze consumer behavior trends)	**50**	√	√		
Assessment 2 – Group Presentation on Social Media Strategy or Content Calendar				√	
Assessment 3 – Hands-on Activity: Create a Basic WordPress Website with SEO			√		
Assessment 4 – Simulation or Use of Google Analytics / Search Console Dashboard				√	√
Assessment 5 – Mini Project: Plan & Execute an AI-Enabled Ad Campaign using Meta or Google Ads.					√

Course Plan

Course Title : Internet Programming	
Course Code : 25MCA1P107	**Semester : I**
Teaching Scheme : L-T-P : 2 -0-2	**Credits : 3**
Evaluation Scheme : IPE Marks: 50	**EPE Marks: 50**

Course Description:

This course introduces the fundamentals of Internet technologies and web development. It consists of the basics of HTML, CSS, and JavaScript for creating interactive websites, explores advanced scripting techniques with jQuery and Bootstrap, and introduces server-side programming using PHP and MySQL. The course also includes practical training in building and managing websites using WordPress, preparing students for full-stack web development.

Course Objectives:

- To design responsive web pages using HTML, CSS, JavaScript, jQuery, and Bootstrap.
- To develop dynamic web apps using PHP and MySQL.
- To build and manage websites using WordPress CMS.

Course Outcomes (COs):

CO1	To understand the fundamentals of the Internet, web standards and protocols.
CO2	To understand & design structured and styled web pages using HTML and CSS.
CO3	To develop interactive web features using JavaScript and DOM.
CO4	To apply advanced JavaScript, jQuery, and Bootstrap for modern web development.
CO5	To build dynamic web applications using PHP and MySQL.
CO6	To create and manage websites using WordPress CMS.

Prerequisite:	Basic knowledge of programming concepts and computer fundamentals is required to understand and develop web-based applications.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	3	2	3	3	3	3	3	1	1	1	1	2	2	2
2	1	2	2	2	3	3	3	3	1	2	3	3	2	2	2
3	1	2	2	3	3	3	3	3	1	2	3	3	2	2	2
4	1	2	2	3	3	3	3	3	1	3	3	3	2	2	2
5	2	2	2	3	3	3	3	3	1	3	3	3	2	2	2
6	1	2	-	3	3	3	3	3	1	3	3	3	2	2	2

Content	Hours
Unit 1: Internet Fundamentals and Web Standards History of Internet and Web. World Wide Web Consortium (W3C). Hypertext, hyperlink, Uniform Resource Locator (URL), Hypertext Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS), Domain Name System (DNS), TCP/IP the protocol of the Internet, Internet Protocol (IP) and concept of IP Addresses. Internet Service Provider (ISP), Autonomous System (AS), Web Browser and Web Server. Free and Proprietary Software.	8
Unit 2: Web Page Design with HTML and CSS HTML-Introduction, HTML Tags, HTML-Grouping Using Div & Span, HTML-Lists, HTML-Images, HTML-Hyperlink, HTML-Table, HTML-Colors, HTML-frame, HTML-Form controls. Introduction of CSS, CSS Syntax, Elements of Style, Linking a style sheet to HTML document, Types of Style Sheets – Inline Style Sheets, Internal or embedded style sheets, External Style Sheets.	7
Unit 3: Interactive Web Development with JavaScript Introduction, Core features, Data types and Variables, Operators, Expressions, Control Statements, Array, Functions, Objects - Date and Math Related Objects, Document Object Model - Event Handling, Controlling Windows & Frames and Documents - Form validations.	8

Unit-4: Advanced JavaScript and Modern Web Technologies Browser Management and Media Management, Classes, Constructors, Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes, Introduction to JSON: JSON Structure, Introduction to jQuery, Introduction to Bootstrap: Bootstrap components.	8
Unit 5: Server-Side Scripting with PHP and MySQL Introduction, Setting up the environment, Programming basics: Print/echo, Variables and constants, Strings and Arrays, Operators, Control structures and looping Structures, Functions, Reading Data in Web Pages: Embedding PHP within HTML, Establishing connectivity with MySQL database.	8
Unit 6: Building Websites with WordPress Introduction of WordPress, WordPress.com vs WordPress.org, Installation of WordPress, Directory & file structure, Dashboard overview, working with page, category, post, tags, and media. Modifying Settings (General, Reading, Writing, Discussion, Media, Permalinks), Install and activate theme. Posts and Pages: Adding Hyperlinks, Playing with Media content, Previewing and Editing Posts, Previewing and Editing Pages, Page Order, Creating a post, Adding Media files to content –images and videos, Using Categories and Tags, Creating Pages, Page Hierarchy	6

Reference Books:

1. Web Technologies (HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and AJAX) by Uttam K. Roy.
2. Web Programming by Chris Bates
3. Internet and Web Technologies by Raj Kamal
4. Beginning PHP and MySQL: From Novice to Professional by W. Jason Gilmore
5. WordPress for Beginners by Dr. Andy Williams

Online References:

Online Resources No.	Website address
1	www. tutorialspoint.com
2	www. W3Schools.com

Evaluation Scheme:

Assessment	Total Marks	Intended course learning outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
IPE	50	√	√	√	√	√	√
EPE	50	√	√	√	√	√	√
Total	100						

Suggestive Formative Assessment Tools/Methods for ISE
(Minimum 3 and Max. 5 tools)

Formative Assessment Tools/Methods	Total Marks	Course Learning Outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
Assessment 1 – Coding Test	50	√	√				
Assessment 2 – Practical Lab Test		√	√	√			
Assessment 3 – Mini Project				√	√	√	√
Assessment 4 – Viva		√	√				
Assessment 5 – Debugging Activity		√	√	√	√	√	√

Course Plan

Course Title: Lab on Database Management System	
Course Code : 25MCA1P108	**Semester: I**
Teaching Scheme:L-T-P:0-0-2	**Credits:1**
Evaluation Scheme: IPE Marks:20	**EPE Marks : 30**

Course Description:

This laboratory course offers in-depth practical exposure to both Relational Database Management Systems (RDBMS) using MySQL and NoSQL Databases using MongoDB. It focuses on the creation, manipulation, and querying of structured and unstructured data through SQL and document-based commands. Students will learn database design, normalization, transaction control, recovery mechanisms, and also compare relational versus non-relational database approaches. By the end of the course, students will be capable of handling real-world database problems using both paradigms effectively.

Course Objectives:

- Understand and implement core concepts of database creation and manipulation using DDL and DML commands.
- Apply relational constraints and perform queries using various SQL clauses.
- Demonstrate database design through ER modeling, normalization, and relational mapping.
- Explore advanced features like views, indexing, transactions, recovery, and concurrency control in RDBMS.
- Install and use MongoDB for handling unstructured/document-based data.
- Implement data operations (insert, update, delete, indexing, aggregation) in MongoDB.
- Compare and contrast RDBMS and NoSQL approaches through a practical case study.

Course Outcomes:

CO1	Design and implement structured relational databases using SQL commands, including table creation, data manipulation, and constraint enforcement.
CO2	Apply query techniques such as filtering, joining, subqueries, aggregation, and indexing to retrieve and manage relational data efficiently.
CO3	Analyze and design database schemas using ER diagrams and normalization techniques up to BCNF to ensure data consistency and integrity.
CO4	Demonstrate transaction control, concurrency, and recovery mechanisms using SQL features and theoretical models.
CO5	Use MongoDB to create and manage document-based collections, perform CRUD operations, and compare relational vs NoSQL approaches for real-world datasets.

Lab Practical

Sr. No.	Details of Experiments
1.	**Create Database and Tables (DDL):** Create StudentDB with tables: Students, Courses, Enrollments. Use CREATE, ALTER, DROP
2	**Insert Data into Tables (DML):** Insert sample data into Students and Courses. Use INSERT INTO, UPDATE, DELETE.
3	**Apply Constraints:** Add PRIMARY KEY, FOREIGN KEY, UNIQUE, CHECK, NOT NULL constraints to the tables.
4	**Querying Data (SELECT + Conditions):** Write SELECT queries with conditions (WHERE, BETWEEN, LIKE) on the same tables.
5	**Join and Subqueries:** Perform INNER JOIN and subqueries to fetch student details along with course names.
6	**Aggregate Functions, Grouping, Sorting:** Use GROUP BY, HAVING, ORDER BY, and aggregation functions like AVG, COUNT, etc.
7	**Views and Indexes:** Create views such as student_view and apply indexes on student names or course IDs.
8	**ER Diagram and Mapping:** Draw ER model for StudentDB and convert it to relational schema.
9	**Normalization (1NF to BCNF):** Take unnormalized student/course data and normalize it step-by-step.
10	**Lossless Join & Dependency Preservation:** Show decomposition of a relation and validate using dependency preservation rules.
11	**Transaction Control Commands:** Simulate a transaction using COMMIT, ROLLBACK, SAVEPOINT on student fee payment.
12	**Check pointing and Shadow Paging:** Theoretical walkthrough of checkpoints and a shadow paging example.
13	**Install MongoDB and Create Collections:** Create a studentDB database with collections: students, courses, enrollments.
14	**Insert and Query Documents:** Insert student and course documents; perform queries with filters and projections.
15	**Update and Delete Operations:** Use updateOne, deleteMany, replaceOne commands on collections.
16	**Indexing and Aggregation:** Use createIndex, $group, $match to group students by department, course count, etc.
17	**Design Schema: Embedded vs Reference:**

	Convert the relational model to document-based structure (embedded or reference schema).
18	**RDBMS vs NoSQL Comparison (Practical):** Create a report comparing operations done in MySQL vs MongoDB for StudentDB.

Evaluation Scheme:						
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)				
		CO1	**CO2**	**CO3**	**CO4**	**CO5**
IPE	**20**	√	√	√	√	√
EPE	**30**	√	√	√	√	√
Total	**50**					

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*						
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** (Please tick as appropriate)				
		CO1	**CO2**	**CO3**	**CO4**	**CO5**
Assessment 1 – Coding Test	**20**	√	√	√		
Assessment 2 – Practical Lab Test		√	√	√		
Assessment 3 – Assignment		√	√			
Assessment 4 – Viva		√	√			
Assessment 5 – Debugging Activity		√	√	√	√	√

Course Plan

Course Title : Lab on Data Structure	
Course Code : **25MCA1P109**	**Semester :I**
Teaching Scheme : L-T-P : 0-0-2	**Credits : 1**
Evaluation Scheme : IPE:20	**EPE Marks:30**

Course Description:

The course aims to aware the students about basics of data structure. It also insists on working with functions and built in data structure. Course also introduce the fundamentals of data structures and will provide understanding of how to systematically organize data in a computer system. Also, includes topics which focus on searching and sorting techniques, linked list, tress and graphs.

Course Objectives:

- To study basics of data structures.
- To study searching & sorting techniques.
- To demonstrate implementation of stack, queue, linked list and trees data structures.

Course Outcomes (COs):

CO1	Understand and analyze concept of stack & queue
CO2	Analyze linked list representation of stack & queue
CO3	Understand and analyze working mechanism of tree traversing algorithms and binary search trees.
CO4	Analyze working mechanism of graphs & graph traversals
CO5	Understand working mechanism of sorting techniques and study its complexity
CO6	Understand working mechanism of searching

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	2	2	1	1	-	-	1	-	-	1	-	-	3	2	-	2
CO2	2	2	2	1	1	-	1	-	-	1	1	-	3	2	-	2
CO3	2	2	2	1	1	-	1	-	-	1	1	-	3	2	-	2
CO4	2	2	2	2	1	-	1	-	-	2	1	-	3	2	-	4
CO5	2	2	2	2	1	-	1	-	-	2	1	-	3	2	-	2
CO6	2	2	2	2	1	-	1	-	-	2	1	-	3	2	-	4

Lab on Data Structures

Unit	Details of Experiment
1	Stack & Queue: Operations on Stack & Queue i) Write a program to implement operations on stack ii) Write a program to implement operations on single queue iii) Write a program to implement operations on circular queue iv) Write a program to demonstrate priority queue v) Write a program for converting a given infix expression to postfix form using stack.
2	**Linked List:** Write a program to demonstrate singly, doubly and circular linked lists
3	**Trees &Graphs:** i) Write a program to demonstrate Trees & Tree Traversals ii) Write a program to demonstrate implementation of Binary Search trees iii) Write a program to create a binary search tree and for implementing the in order, preorder, post order traversal using recursion iv) Write a program to demonstrate implementation of Graphs as an Arrays

	v) Write a program to demonstrate implementation of Graphs as Linked List
4	**Searching and Sorting Techniques:** i) Implementation of Selection sort, Bubble sort, Insertion sort, Quick sort, Merge sort & Radix sort ii) Implementation of Binary search & Selection search

Reference Books

1. Data Structure and Algorithmic Thinking with Python Paperback – 2015 by Narasimha Karumanchi
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C, Second Edition, University Press, 2008.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms, Pearson Education, 1983.

Online References:

Online Resources No.	Website address
1	https://nptel.ac.in/courses/106102064
2	nptel.ac.in/courses/106/106/106106127/
3	www.courseera.com

Assessment scheme:

SN	Assessment	Weightage	Remark
1	In semester Evaluation 1 (ISE1)	50%	Practical Assignment, Practical Exam, Journal, etc.
2	End Semester Examination (ESE)	50%	Practical ESE examination

Course Plan

Course Title: Universal Human Values	
Course Code : 25MCA1L111	**Semester: I**
Teaching Scheme: L-T-P: 2-0-0	**Credits:2**
Evaluation Scheme : ISE1+ISE2= 25+25 =50	ESE-

Course Description:

The course aims to introduce the student to value and its need. It introduces making the students to understand the terms through various examples and bringing in a holistic perception of existence. It also considers to understand the students the importance of harmony with human being. It also mains to make the students to understand the terms through various examples and bringing in a holistic perception of existence.

Course Objectives:

- To help the student to see the need for developing a holistic perspective of life.
- To sensitize the student about the scope of life – individual, family, society and nature/existence.
- To aware the students about strengthening self-reflection.
- To develop more confidence and commitment to understand, learn and act accordingly

Course Outcomes (COs):

CO1	Understand an overview of Prerequisites to Human Values
CO2	Understand the role of a human being in ensuring harmony in self and society
CO3	Analyze a harmonious environment for holistic development of self and body.
CO4	Analyse ethical dilemma while discharging duties in professional life.

Prerequisite: Importance of ethics

Content	**Hours**

Unit 1: Introduction to Value Education Value Education, Definition, Concept and Need for Value Education, Self exploration as a means of Value Education.	5
Unit2: Harmony in Human Being Human Being is more than just the Body, Harmony of the Self („I") with the Body - happiness and physical facility , Understanding Myself as Co-existence of the Self and the Body, Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.	8
Unit 3: Harmony in the Family and Society and Harmony in the Nature Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude, Prosperity and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour. Harmony in Nature: The Four Orders in Nature, The Holistic Perception of Harmony in Existence.	8
Unit 4: Professional Ethics Value based Life and Profession. , Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current Scenario.	7

Reference Books:

1. Bertrand Russell," Human Society in Ethics & Politics", -, Publication -Taylor and Francis, (2015)
2. I.C. Sharma, "Ethical Philosophy of India" -Johnson publication, 1965

Online Resources:

Online Resources No.	Website address
1	https://fdp-si.aicte-india.org/verifiedProgramDetailsList.php
2	https://citizenchoice.in/course/Universal-Human-

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE	**20**	√	√	√	√	√	√
MSE	**30**	√	√	√	√	√	√
ESE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Poster Presentation	**20**	√	√		√		
Assessment 2 – Concept Map / Diagram Drawing + Search Problem Solving		√	√	√	√		
Assessment 3 – Open Book Assignment		√				√	√
Assessment 4 – Group Presentation on AI Applications		√			√	√	√
Assessment 5 – Hands-on Lab Task (or Video Submission)			√	√	√		

Course Title: Operating System	
CourseCode:25MCA1L201	**Semester: II**
TeachingScheme:L-T-P:3-0-0	**Credits:3**
Evaluation Scheme : ISE+MSEMarks:20+30	**ESE Marks:50**

Course Description:

This course introduces the concept of operating system & types of operating system. It also introduces process management and scheduling algorithm. It covers memory management, virtual memory and page replacement algorithms. It also includes interposes communication and deadlocks.

Course Objectives:

- To acquire knowledge eregarding structure and working of the major operating system components.
- To learn and apply different process and memory scheduling algorithms and synchronization techniques to achieve better performance of computer system.
- To understand structure and organization of file system.

Course Outcomes(COs):

Upon successful completion of this course, the students will be able to:

CO1	Understand the concept of Operating system
CO2	Analyze the working mechanism of Process management & compare the performance of CPU scheduling algorithms
CO3	Understand Inter-process communication & synchronization
CO4	Analyze deadlock detection, prevention & recovery techniques
CO5	Comprehend mechanism of memory management, paging and segmentation
CO6	Understand the mechanism of storage management& disk scheduling algorithms

Prerequisite:	Basic Knowledge of Computer

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-	4
CO3	1	2	2	-	-	-	-	-	-	-	-	-	1	-	-	4
CO4	1	2	2	-	-	-	-	-	-	-	-	--	-	-	-	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO6	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2

Content	Hours
Unit 1: Introduction to Operating System Overview of Operating system Definition and purpose, History and evaluation, Types of OS- Batch System, Time-sharing, Multitasking, Multiprogramming, Multiprocessing, Real time, Distributed operating system, Embedded operating system. Operating System Architecture- System components, OS services and functions, operating system structure- simple, monolithic, Microkernel, Layered, Modular. User operating-system interface: command line interface, GUI, system calls , Interrupt Concept, Concept of Virtual Machine, System Calls, System Programs	6
Unit 2: Process Management Process, Thread- Definition Concept, Difference between Process and Thread, Process Control Block (PCB), ,process states and its transitions,context switch, Inter-process Communication, Communication in Client-Server .OS services for Process management, CPU scheduling and types of schedulers, Scheduling algorithm-FCFS, SJF, RR, Priority based, SRJF, multilevel queue, multiprocessor scheduling, Real time scheduling	8

Unit 3: Memory Management Introduction, Memory hierarchy, Base and limit registers, swapping**,** Memory Management Techniques -Contiguous & Non Contiguous allocation, Fixed partitioning, Dynamic partitioning, Fragmentation, paging- Demand paging, Page fault, page tables and page replacement algorithms (FIFO, LRU, Optimal), multilevel paging and inverted page tables. Segmentation – Basic concepts, Segmentation hardware, Segmentation with paging.	8
Unit 4: Inter-process Communication and Synchronization Need, critical section problem, Synchronization mechanisms - Mutual Exclusion, Semaphore, Busy-wait Implementation, characteristics of semaphore, queuing implementation of semaphore, classic synchronization problems - producer consumer, Readers-Writers, **Deadlock** -concept, Necessary Conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance, Bankers Algorithm, Deadlock Detection, Deadlock Detection Algorithm for Single and Multiple Instance of Resources, Deadlock Recovery	8
Unit 5: Storage management **File System**: Files-basic concept, file attributes, file operations and types, file structure, access methods, FILE system, Implementation, Directory structure and organization- single level directory system, two level directory system, hierarchical directory system, directory operations, protection, security, allocation method, Recovery. Disk Management: Disk Structure, Disk Scheduling algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK),	8
Unit 6: I/O systems I/O hardware- I/O devices and controllers, Direct Memory Access (DMA), I/O system layers, Device drivers, Interrupt handling Network operating system – Networking basics, Network operating system functions, Network protocols (TCP/IP, UDP)	7

Reference Books:

1. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Prentice Hall of India, 2 nd Ed. 2006
2. AchyutGodbole, ―Operating System‖, Tata McGraw Hill,3rd Ed.2013

3. Abraham Siberschatz, Peter Galvin Operating Systems: Concepts - Willey- Sixth edition.
4. D.M. Dhamdhere, System Programming and Operating Systems -TMH –SecondEdition.
5. William Stallings,Operating Systems: Internals and Design Principles, Seventh Edition, Pearson Publications
6. Madnick and Donovan , Operating Systems -Tata McGraw-Hill Education

Online References:

Online Resources No.	Website address
1	https://www.geeksforgeeks.org/introduction-of-operating-system-set-1/
2	https://www.javatpoint.com/os-tutorial
3	https://www.cse.iitb.ac.in/~mythili/os/

Evaluation Scheme:

Assessment	Total Marks	Intended course learning outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
ISE	20	√	√	√	√	√	√
MSE	30	√	√	√			
ESE	50	√	√	√	√	√	√
Total	100						

Suggestive Formative Assessment Tools/Methods for ISE
(Minimum3andMax.5 tools)

Formative Assessment Tools/Methods	Total Marks	Course Learning Outcomes to be assessed*(Pleasetickas appropriate)*					
		CO1	CO2	CO3	CO4	CO5	CO6
Assessment 1– Quizzes/MCQs	20	√			√		
Assessment 2–Assignment Submissions			√	√	√	√	√
Assessment 3–Program solving			√	√	√		
Assessment 4– Presentations/Seminars					√	√	√
Assessment 5–Class Tests(Descriptive)		√		√	√		

Course Plan

Course Title : Software Project Management	
Course Code : 25MCA1L202	**Semester : II**
Teaching Scheme : L-T-P : 3 -0-0	**Credits : 3**
Evaluation Scheme : ISE+MSE Marks: 50	**ESE Marks: 50**

Course Description:
This course provides an in-depth understanding of managing software projects effectively. It covers project planning, estimation, scheduling, costing, risk management, quality assurance, monitoring, and control. It also explores modern trends like Agile, DevOps, and real-world case studies to build industry-ready project managers.

Course Objectives:

- Understand the concepts, tools, and techniques for effective software project management.
- Learn to plan, estimate, schedule, and manage software development lifecycle.
- Analyze and manage cost, risk, and quality in software projects.
- Apply monitoring and control mechanisms for successful project delivery.
- Explore modern project management practices and case studies for practical exposure.

Course Outcomes (COs):

CO1	Understand basic concepts of software project management, stakeholder roles, and key management tools.
CO2	Demonstrate the ability to estimate, plan, and schedule software projects using structured techniques and tools.
CO3	Apply budgeting techniques and risk management strategies to control project costs and uncertainties.
CO4	Implement software quality assurance practices and configuration control mechanisms to ensure project consistency and reliability.
CO5	Analyse project performance using key metrics and apply control techniques to address issues effectively.
CO6	Analyse real-world case studies and modern practices to understand their impact on software project success.

Prerequisite:	The student should possess basic knowledge of software engineering principles, understand the software development life cycle (SDLC), and be familiar with programming and system design concepts.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1		1	-	3	1	3		2	1	3	3	1	1		2	1, 2
CO2	2	2	2	3	2		3	3	1	3	3		1	1	1	2
CO3	2	2	3	3	2	3	3	3	1	3	3	3	2	2	3	3
CO4	1	2	2	3	3	3	3	3	1	3	3	2	2	3	1	3
CO5	1	2	2	3	2	3	3	3	1	3	3	2	2	3	1	3
CO6	1	3	3	3	3	3	3	3	1	3	3	3	2	3	3	3

Content	Hours
Unit 1: Introduction to Software Project Management 1.1 Definition and scope of software project management 1.2 Characteristics of software projects vs traditional projects 1.3 Project life cycle and project processes 1.4 Role of project manager 1.5 Project management tools and techniques 1.6 Stakeholder management and communication	7
Unit 2: Project Planning and Scheduling 2.1 Project initiation and feasibility study 2.2 Project estimation techniques: LOC, FP, Use-case point, COCOMO models 2.3 Work Breakdown Structure (WBS) 2.4 Project scheduling: Gantt charts, PERT and CPM 2.5 Resource allocation and levelling 2.6 Risk identification and assessment	8
Unit 3: Project Costing and Risk Management 3.1 Cost estimation and budgeting techniques 3.2 Cost monitoring and control 3.3 Risk management process 3.4 Risk analysis and mitigation strategies 3.5 Contingency planning 3.6 Software Quality Risk Management	8
Unit 4: Software Quality Assurance and Configuration Management 4.1 Importance of software quality 4.2 Quality assurance vs quality control 4.3 SQA activities and metrics 4.4 Configuration management process 4.5 Version control tools (e.g., Git, SVN) 4.6 Change control and audits	7
Unit 5: Project Monitoring and Control 5.1 Project tracking and status reporting 5.2 Performance metrics (EVM – Earned Value Management) 5.3 Monitoring tools and dashboards 5.4 Schedule and cost variance 5.5 Issue management and escalation 5.6 Managing project teams and interpersonal issues	8
Unit 6: Modern Trends and Case Studies 6.1 Agile project management (Scrum, XP) 6.2 DevOps and continuous delivery pipelines 6.3 Project management in cloud-based development 6.4 Case studies of successful and failed software projects 6.5 Project closure and post-mortem analysis 6.6 Industry-standard project management tools (e.g., MS Project, JIRA)	7

- **Reference Books**:

1. Software Project Management – **Bob Hughes & Mike Cotterell**
2. Software Engineering – A Practitioner's Approach – **Roger S. Pressman**
3. Applied Software Project Management – **Andrew Stellman& Jennifer Greene**
4. Agile Project Management with Scrum – **Ken Schwaber**
5. The Mythical Man-Month – **Frederick P. Brooks**

Online references:

Online Resource No.	Website Address
1.	https://www.open.edu/openlearn/money-business/agile-project-management/content-section-0
2.	https://www.computer.org/education/bodies-of-knowledge/software-engineering
3.	https://www.tutorialspoint.com/software_engineering/software_project_estimation.htm
4.	https://www.guru99.com/software-quality-assurance.html
5.	https://guides.github.com/introduction/git-handbook/
6.	https://www.atlassian.com/software/jira/guides/getting-started/introduction

Evaluation Scheme:

Assessment	Total Marks	Intended course learning outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
ISE	20	√	√	√	√	√	√
MSE	30	√	√	√			
ESE	50	√	√	√	√	√	√
Total	100						

Suggestive Formative Assessment Tools/Methods for ISE
(Minimum3andMax.5 tools)

Formative Assessment Tools/Methods	Total Marks	Course Learning Outcomes to be assessed*(Please tick as appropriate)*					
		CO1	CO2	CO3	CO4	CO5	CO6
Assessment1– Quizzes/MCQs	50	√			√		
Assessment2–Assignment Submissions			√	√	√	√	√
Assessment3–Case Study			√	√	√		
Assessment4– Presentations/Seminars					√	√	√
Assessment5–Class Tests(Descriptive)		√		√	√		

Course Plan

Course Title: Elective-I (Foundations of Data Analytics)	
Course Code: 25MCA1L203-1	**Semester: II**
Teaching Scheme: L:T:P = 3:0:0	**Credits: 3**
Evaluation Scheme: ISE+MSE Marks:50	**50**

Course Description:

This course builds upon foundational data analytics techniques and focuses on applying advanced analytics techniques to real-world datasets. Businesses are generating massive amounts of data every second. Therefore, the need for professionals who can analyze, interpret, and transform this information into actionable insights is alarming. Nowadays, every sector relies on data-driven strategies, such as healthcare, finance, retail, technology, and government. This urgency ensures a steady demand for data analytics professionals. Analytics professionals will remain at the heart of innovation, automation, and strategic decision-making.

Course Objectives:

- To apply advanced data preparation and transformation techniques to real-world datasets
- To build and fine-tune analytical models using appropriate metrics
- To study data preprocessing, importing & exporting of data
- To study lookup tables,

Course Outcomes (COs):

After successful completion of this course, the students will be able to:

CO1	Perform feature selection, transformation, and extraction using domain knowledge and data patterns
CO2	Develop interpretable classification and regression models and evaluate using advanced metrics
CO3	Create interactive charts and visual analytics using Plotly and Dash
CO4	Design business dashboards using Tableau and Power BI
CO5	Apply visual storytelling to communicate patterns, trends, and insights
CO6	Evaluate visuals and reports for ethics, accessibility, and impact

Prerequisites:	Completion of "Data Science" or equivalent course

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	Pos												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-	4
CO3	3	2	2	3	-	-	-	-	-	-	-	-	3	3	-	3
CO4	3	3	3	3	-	-	-	2	-	-	2	2	3	3	2	4
CO5	3	2	2	2	-	-	-	3	-	-	2	2	3	3	2	4
CO6	2	2	-	-	-	3	2	2	-	-	2	3	2	3	3	5

Content	Hours
Unit 1: Advanced Data Analytics for Business Intelligence Understanding data and its types, Importance of analytics in businesses, Difference between Data Science and Business Analytics, Analytics maturity model for organizations, Key performance indicators and business metrics, Analytics project lifecycle in business context , Stakeholder management and requirement gathering, ROI measurement for analytics projects	7
Unit 2: Analytical Modeling & Evaluation Logistic regression, Decision Trees, feature importance, ROC curves, precision-recall tradeoff, SHAP, model comparison	8
Unit 3: Data preprocessing Dataset and different type of attributes, Data quality, Noise, understanding domain and dataset, basic insights from data set, Importance of data preprocessing, Structured and unstructured data, Importing and exporting data, cleaning and preparing of data, Identify and handling of missing value, data formatting and data normalization	8
Unit 4: Excel for data Analytics Data cleaning and organization, Specifying PivotTable data, Working with PivotTable Layout, lookups, and formulas, Basic data modeling, Data Validation, Scenarios, Sub Totals, Creating a PivotTable,	7
Unit 5: Model Development and evaluation Linear regression, model evaluation using visualization, R-Squared and MSE for In-Sample evaluation, Prediction and decision making, over-fitting, under-fitting and model selection,	7
Unit 6 : DATA ANALYSIS Statistical Methods: Classification, SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics	7

Reference Books:

1. Joel Grus, *Data Science from Scratch*, 2nd Edition, O'Reilly Media
2. Alberto Cairo, The Truthful Art: Data, Charts, and Maps for Communication, New Riders
3. Wes McKinney, Python for Data Analysis, O'Reilly Media
4. Nathan Yau, Data Points: Visualization That Means Something, Wiley

5. Ben Fry, Visualizing Data, O'Reilly
6. Wes McKinney, "Python for Data Analysis- data wrangling with Pandas, NumPy and Ipython", O'REILLY

Online References:

Online Resources No.	Website address
1	https://plotly.com/python/
2	https://public.tableau.com/
3	https://shap.readthedocs.io/

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE	**20**	√	√	√	√	√	√
MSE	**20**	√	√	√	√	√	√
ESE	**60**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Class Test/ Unit Test	**40**	√	√	√	√	√	√
Assessment 2 – Development of unsupervised machine learning problem		√	√	√	√	√	√
Assessment 3 – Development of unsupervised machine learning problem		√	√	√	√	√	√
Assessment 4 – Viva Voce / Oral		√	√	√	√	√	√
Assessment 5 – Portfolio Submission		√	√	√	√	√	√

Course Plan

Course Title: Elective-II –Mathematical Foundations for Machine Learning	
Course Code: 25MCA1L203-2	**Semester: II**
Teaching Scheme: L:T:P = 3:0:0	**Credits: 3**
Evaluation Scheme: 50 + 50	

Course Description:

Mathematical models assist AI to consume, learn, and make sound decisions based on the data it receives. It is used for data representation and manipulation. Probability and statistics -help AI to make decisions in a state of uncertainty and enhance predictions over time. Key concept is to study linear algebra, modelling uncertainty with the help of probability & statistics. It also aims to improve different types of regression and regularization techniques.

Course Objectives

- To build strong mathematical intuition required for Machine Learning algorithms
- To understand linear algebra and probability techniques
- To understand statistical and optimization techniques
- To enable students to mathematically analyze and implement ML models

Course Outcomes (COs):
After successful completion of this course, the students will be able to:

CO1	Apply linear algebra concepts in Machine learning models
CO2	Understand working mechanism of support vector machine & SVM Kernels
CO3	Construct probability distributions with the given dataset
CO4	Apply probability distribution for data analysis and prediction
CO5	Understand regression & regularization techniques used in learning algorithms
CO6	Analyse Machine learning algorithms mathematically

Prerequisites:	Basic Mathematics or equivalent course

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	**POs**												**PSOs**			**BTL**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	
CO1	**3**	**3**	**3**	**3**									**3**	**3**		**3**
CO2	**3**	**3**	**3**	**3**									**3**	**3**		**4**

CO3	**3**	**2**	**2**	**3**									**3**	**3**		**3**
CO4	**3**	**3**	**3**	**3**				**2**			**2**	**2**	**3**	**3**	**2**	**4**
CO5	**3**	**2**	**2**	**2**				**3**			**2**	**2**	**3**	**3**	**2**	**4**
CO6	**2**	**2**				**3**	**2**	**2**			**2**	**3**	**2**	**3**	**3**	**5**

Content	**Hours**
Unit 1: Vectors & Matrix for Machine Learning Why linear algebra for Machine Learning , Scalars, Vectors, Vector Spaces and Subspaces & Matrices, Matrix Operations and Properties , Special Matrices (Diagonal, Identity, Orthogonal, Symmetric) ,Determinants and Rank of a Matrix, Eigenvalues and Eigenvectors , Singular Value Decomposition (SVD)	8
Unit 2: Support Vector Machine Introduction to Support Vector Machines(SVM), key concepts of SVM-hyperplane, support vectors, margin, kernel, Working mechanism of SVM, Types of SVM algorithms: Linear, Non Linear SVM, Optimal Separation: The Margin and Support Vectors, a Constrained Optimization Problem, Slack Variables for Non-Linearly Separable Problems, SVM Kernels, Types: Linear kernel, Polynomial kernel, Radial basis function kernel	8
Unit 3: Random Variables Random Variable and Distributions: Introduction to random variable , Types of random variable-–discrete and continuous, probability distribution of a random variable, mathematical expectations , Mean & Variance of random variable, moment generating function	8
Unit 4: Probability Theory Basic Concepts of Probability , Probability Distributions : Binomial, Poisson , Uniform, Normal, Exponential , Expectation, Variance, Covariance, Joint and Conditional Probability , Bayes' Theorem	8

Unit 5: Linear Models and Matrix Methods Linear Regression (Simple and Multiple)-Properties, Least Squares Method, Normal Equation, Polynomial Regression, Interval estimation in simple linear regression Regularization Techniques : Ridge Regression, Lasso Regression, Logistic regressions , Matrix Formulation of Linear Models	7
Unit 6: Information Theory Basics Information Theory Basics : Entropy , Cross-Entropy , KL-Divergence , Perceptron, Neural Networks, Gradient-based Optimization, Error Back Propagation	6

Reference Books

1. **Deisenroth, Faisal & Ong**, Mathematics for Machine Learning, Cambridge University Press
2. **Gilbert Strang**, Linear Algebra and Its Applications
3. **Sheldon Ross**, A First Course in Probability
4. Christopher M. Bishop, *Pattern Recognition and Machine Learning*
5. Trevor Hastie et al., *The Elements of Statistical Learning*
6. Erwin Kreyszig, *Advanced Engineering Mathematics*

Online References:

Online Resources No.	Website address
1	https://www.youtube.com/watch?v=Cvb-52mIoBU&list=PLgMDNELGJ1CYPJS6m_ygxb4KtHYxh1HjR
2	https://www.youtube.com/watch?v=ZftI2fEz0Fw&list=PLKnIA16_Rmvbr7zKYQuBfsVkjoLcJgxHH
3	https://www.youtube.com/watch?v=vbs9WGWjS9U&t=81s

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
ISE	**20**	√	√				
MSE	**30**	√	√	√			
ESE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Example for Practice	**50**	√	√				
Assessment 2 – Example for Practice			√	√	√	√	
Assessment 3 – Examples with graph paper			√	√	√	√	
Assessment 4 – Oral Viva		√	√	√	√	√	√
			√	√	√	√	

Course Plan

Course Title : Cyber Security	
Course Code : 25MCA1L204	**Semester : II**
Teaching Scheme : L-T-P : 3 -0-0	**Credits : 3**
Evaluation Scheme : ISE+MSE Marks: 50	**ESE Marks: 50**

Course Description:

This course offers a comprehensive overview of cybersecurity concepts, threats, defence mechanisms, and legal frameworks, blending foundational knowledge with advanced topics. It explores types of cyber-attacks, network protection strategies, cyber laws in India, and the impact of IoT and mobile device vulnerabilities. The syllabus extends into specialized domains such as block chain security, digital forensics, and machine learning for threat detection, preparing students for practical roles in cybersecurity and information assurance domains.

Course Objectives:

- Understand key principles of cyber security including threats, vulnerabilities, and the CIA triad.
- Analyze various cyber-attacks and employ tools such as IDS, IPS, honeypots, and digital certificates.
- Develop familiarity with network defense techniques, secure communication tools, and APT analysis.
- Learn and evaluate legal frameworks like the IT Act 2000, IPC sections, and GDPR in cyber law context.
- Explore mobile and IoT security challenges, and implement secure software development practices.
- Investigate blockchain applications, forensic methods, and machine learning for security automation.

Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:

CO1	Define cybersecurity fundamentals, the CIA triad, and explain modern threat landscapes across industries.
CO2	Detect, classify, and respond to cyber threats using IDS/IPS, honeypots, and adversary frameworks.
CO3	Understand network security practices like VPNs, DNS filtering, and secure communication (PGP/S-MIME).
CO4	Analyze cyber laws, especially Indian IT Act 2000, and relate them to common cybercrime scenarios.
CO5	Identify mobile and IoT vulnerabilities, and implement ethical hacking and secure DevSecOps strategies.

CO6	Apply knowledge of blockchain auditing, digital forensics tools, and machine learning techniques to improve security posture and incident response.

Prerequisite:	Basic knowledge of computer systems, operating systems, and networking fundamentals.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	2	2	–	–	–	2	–	–	–	–	–	1	2	–	–	**2**
CO2	–	3	2	–	2	–	–	–	–	–	–	2	3	–	2	**3**
CO3	–	2	–	2	2	–	–	–	–	–	–	2	2	–	3	**2**
CO4	–	–	–	–	–	3	–	2	–	–	–	3	–	–	–	**4**
CO5	–	2	2	–	2	2	–	–	–	–	–	3	3	–	2	**3**
CO6	2	2	–	2	3	–	1	–	–	–	–	3	2	–	3	**4**

Content	Hours
Unit 1: Introduction to Cyber Security Threats Overview of Cyber Security The CIA Triad: Confidentiality, Integrity, and Availability Types of Cyber Attacks (Virus, Worms, Phishing, Trojans, Ransomware, etc.) Cyber Attacks in different sectors: Government, Retail, Energy, Telecom Introduction to Cyber Resilience and its lifecycle. Introduction to Threat Modeling (STRIDE, DREAD)	8
Unit 2: Cyber Threats and Protection Methods Cyber-Threat Hunting, Intrusion Detection System (IDS), Intrusion Prevention System (IPS): Introduction to Honeypots and their Types. Cyber-Attack Adversary Frameworks: Understanding the attackers, Cryptography. Digital Signatures and Certificates.	7
Unit 3: Network Security Practices and Advanced Threat Analysis Secure Network Services: DNS, VPNs, NAT; Secure Email Systems: PGP, S/MIME, Web Security Practices: Filtering Services in Browsers, Advanced Threats: Crypto Mining, Dark Web Activity, Enterprise-grade Security Practices, Case Study: Advanced Persistent Threats (APT)	8
Unit 4: Cyber Law Introduction to Cyber Law: Need and Importance, Three Bodies of Law (Criminal, Civil, Regulatory), IT Act 2000 & its Amendments, Cybercrime Classification and Penalties, Indian Penal Code (IPC) Section Mapping, Cybercrime and Technology in the Student Context Comparison with GDPR and International Standards (brief).	7

Unit 5: Mobile, IoT Security & Security Management Mobile and IoT attack surface, Recent most threatening IoT cyber-attack scenarios, Cyber Security Management: Ethical Hacking, Penetration Testing, National Cyber Security Policy. Introduction to Secure SDLC and DevSecOps.	**7**
Unit-6: Blockchain, Forensics & Machine Learning in Security Blockchain Fundamentals & Smart Contract Auditing, Secure Containerization: Docker, Kubernetes, Digital Forensics: Evidence Collection, Chain of Custody, Autopsy Demo, Incident Response Process and Policy Drafting, ML in Cybersecurity: Autoencoders, Clustering, Adversarial ML and SOAR (Security Orchestration, Automation & Response)	**8**

- **Reference Books:**

1.Cyber Security Practitioner by IBM Corporation
2. IBM QRadar SIEM Foundations by IBM Corporation
3. Cybersecurity Essentials" by Charles J. Brooks
4. The Basics of Hacking and Penetration Testing" by Patrick Engebretson
5. Cryptography and Network Security - William Stallings
6. Cyber Security - Sumit Belapure & Nina Godbole
7. Cyber Laws in India - Kameshwar C.

Online References:

Online Resources No.	Website address
1	https://cybersecurityventures.com/
2	https://www.coursera.org/specializations/intro-cyber-security
3	https://www.geeksforgeeks.org/cyber-security-tutorial/
4	https://www.cybrary.it/course/intro-to-it-and-cybersecurity/

Evaluation Scheme:

Assessment	Total Marks	Intended course learning outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
ISE	20	√	√	√	√	√	√
MSE	30	√	√	√			
ESE	50	√	√	√	√	√	√

Total	**100**						

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*					
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*			
		CO1	**CO2**	**CO3**	**CO4**
Assessment 1: Case Study Report – Analyze cyber-attacks in different sectors (Govt, Retail, etc.) and identify security breaches	**20**	✓	✓		
Assessment 2: IDS/IPS Simulation Task – Practical or demo-based activity on detecting threats using IDS/IPS or honeypots			✓	✓	
Assessment 3: Network Security Quiz – Technical MCQ/short answers on VPN, DNS filtering, PGP, S/MIME concepts				✓	
Assessment 4: Presentation – Role-play on cyber laws and real-world crime cases under IT Act 2000					✓

Course Plan

Course Title : JAVA Programming	
Course Code : 25MCA1P205	**Semester : II**
Teaching Scheme : L-T-P : 2 -0-2	**Credits : 3**
Evaluation Scheme : IPE Marks: 50	**EPE Marks: 50**

Course Description:

This course introduces students to the fundamentals of Java programming and object-oriented design. It covers core topics such as data types, control structures, arrays, and functions, along with object-oriented concepts like classes, inheritance, polymorphism, and interfaces. Students will learn to build GUI applications using Swing, connect to databases using JDBC, and develop web applications using Servlets and JSP. The course emphasizes practical programming skills through hands-on coding, using IDEs like Eclipse or NetBeans.

Course Objectives:

- Learn core Java concepts and object-oriented programming.
- Build desktop applications using Swing and database connectivity with JDBC.
- Develop simple web applications using Servlets and JSP.

Course Outcomes (COs):

CO1	Understand and apply the fundamental concepts of Java programming, including syntax, control structures, data types, arrays, and functions.
CO2	Implement object-oriented programming principles using classes, objects, constructors, access modifiers, and method overloading.
CO3	Demonstrate the use of inheritance, polymorphism, interfaces, abstract classes, and packages in Java applications.
CO4	Handle exceptions effectively and develop multithreaded applications using Java's threading model.
CO5	Build interactive GUI applications using Swing components with database connectivity.
CO6	Develop web-based applications using Servlets and JSP, including session tracking and database integration.

Prerequisite:	Basic understanding of computer operations and fundamental programming concepts.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	3	2	-	3	2	-	1	1	1	1	2	2
CO2	2	2	2	2	2	-	3	2	-	2	2	1	1	2	2
CO3	2	2	2	2	3	-	3	2	-	2	2	1	1	2	2
CO4	2	2	2	2	3	-	3	2	-	1	2	1	1	2	2
CO5	2	2	2	3	3	-	3	3	1	3	3	3	2	2	2
CO6	2	2	2	3	3	-	3	3	1	3	3	3	2	2	2

Content	Hours
Unit 1: Introduction to JAVA programming Java Basics: Features of Java, History of Java, Installations of JDK and eclipse/NetBeans as IDE, Java Components: Java Virtual Machine (JVM), Java Runtime Environment (JRE), Byte code and Garbage Collection. Java Environment setup. Structure of Java program, Writing and executing first Java program. Java data types, variables, operators, expressions, type conversion and casting in Java. Control structures in java: if, if-else and switch statements. Iterative/looping statements in Java: while, do-while and for. Jump Statements: break, continue, return. Array of Primitive Data types, Types of Arrays: one-dimensional and two-dimensional array. Functions: Need of functions/ methods, Writing and using static method; concepts of passing values and returning	8

Unit 2: Object Oriented Programming Concepts Introduction to Object Oriented concepts, defining a class, Java naming conventions for class, properties and methods/functions, creating objects from class, adding attributes and methods to the class. Constructors, constructor overloading. Modifiers – public, private, protected, default, static, final. Wrapper classes, String Class and its methods. User Input: Scanner class.	7
Unit 3: Polymorphism, Inheritance, Interface & Packages Polymorphism: Introduction, Method Overloading, Dynamic Method Dispatch. Inheritance: Basics of inheritance, Types of inheritance, Overriding super class methods. Interface: Defining interface, implementing interface, multiple inheritance using interface. Abstract class and final keyword. Package: Concept of package, creating and accessing a package, importing, packages, creating user defined packages.	8
Unit-4: Exception handling and Multithreading Types of errors, exceptions, try…catch statement, multiple catch blocks, throw and throws keywords, finally clause, user defined exceptions. Concept of Multithreading, creating thread, extending thread class, implementing Runnable interface, life cycle of thread, Thread priority.	6
Unit 5: Swing & JDBC Introduction to Swing, Components hierarchy, Swing components: JFrame, Jlabel, JTextField, JPassword, JTextAres, JButton, JCheckBox, JRadioButton, JComboBox, JList, JMenu ,JtabbedPane , JScrollBar , JColorchooser, JFile Chooser, JTable, Dialogs (Message, confirmation, input), Layout Manager: Flow Layout, Grid Layout, Border Layout, Card Layout. Event Handling: Event-Delegation-Model, Event classes: Mouse Event Class, Action Event Class, Key Event Class, Window Event Class, Text Event Class, MouseMotion Event class. Event listener interfaces: Mouse Listener, Action Listener, Window Listener and Key Listener, MouseMotion Listener, Focus Listener. JDBC: Overview of DBMS, Working with JDBC, Type of drivers, Making the Connection, working with Statements, ResultSet, Simple program-database operations like creating tables, CRUD (Create, Read, Update, Delete) operations using SQL.	8

Unit 6: Servlet & JSP Servlet: Introduction of servlet, Uses of servlet, Life cycle of servlet, Execution process of Servlet Application, Servlet API: packages- javax.servlet and javax.servlet.http, , Handling Http Request & Responses, Using Cookies- Session Tracking, Servlet & JDBC. JSP: Introduction to JSP, Components of JSP Directives, Tags, Scripting Elements, Execution process of JSP Application, building a simple application using JSP, JSP with Database, JSP v/s Servlet	8

Reference Books:

1. Java 2 Complete Reference - (Tata McGraw Hill)
2. Herbert Schildt, Java2: The Complete Reference, Tata McGraw-Hill
3. Java server pages
4. Java 2EE – Ivan Bayross (PHI)
5. Java 2 Black Book –(DreamTech)

Online References:

Online Resources No.	Website address
1	www. tutorialspoint.com
2	www. W3Schools.com
3	https://archive.nptel.ac.in/courses/106/105/106105191
4	https://onlinecourses.nptel.ac.in/noc22_cs47
5	https://www.udemy.com/course/java-programming-complete-beginner-to-advanced/?couponCode=IND21PM

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
IPE	**50**	√	√	√	√	√	√
EPE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for IPE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Assessment 1 – Assignments / Mini Tasks	**50**	√	√	√	√	√	√
Assessment 2 – Practical / Lab Performance		√	√	√	√	√	√
Assessment 3 – Project / Mini Project		√	√	√	√	√	√
Assessment 4 – Viva / Oral Examination		√	√	√	√	√	√
Assessment 5 – Portfolio Submission		√	√	√	√	√	√

Course Plan

Course Title: Python Programming	
Course Code: 25MCA1P206	**Semester: II**
Teaching Scheme: L-T-P: 2-0-2	**Credits: 3**
Evaluation Scheme: IPE Marks: 50	**ESPE Marks:50**

Course Description:

This course introduces students to Python programming through a hands-on, practical-oriented approach. It covers core Python syntax, control structures, data structures, object-oriented programming, file handling, modules, numerical computing with NumPy, and data visualization with Matplotlib and Seaborn. The course aims to build foundational and advanced skills to develop real-world applications and perform data analysis.

Course Objectives:

- To understand Python fundamentals, control flow, and functions for solving basic problems.
- To Work with built-in Python data structures including lists, dictionaries, sets, and tuples.
- To apply object-oriented principles to write structured and modular code.
- To perform file, I/O operations, handle exceptions, and organize code using modules and packages.
- To use the NumPy library for efficient numerical and matrix operations.
- To create a wide range of visualizations using Python libraries to represent and analyze data effectively

Course Outcomes (COs):

After successful completion of this course, the students will be able to:

CO1	Develop Python programs using basic syntax, control structures, and functions.
CO2	Implement solutions using Python's built-in data structures and string operations.
CO3	Design and apply object-oriented programming constructs like classes and inheritance.
CO4	Work with files, handle exceptions, and manage Python modules and packages.
CO5	Perform array-based numerical computation using NumPy.
CO6	Visualize and interpret data using Matplotlib and Seaborn.

Prerequisites:	Basic understanding of computer programming concepts.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	Pos												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	2	1	2	2	3		3			1			1	2	1	3
CO2	3	2	2	2	3		3			1			2	2	2	3
CO3	2	3	2	2	3	3	3	3	1	3	3	1	1	2	2	3
CO4	1	2	2	3	3	2	3	3	1	3	3	3	2	2	2	3,4
CO5	3	3	2	3	3		3		1	3	1		1	2		3
CO6	1	3	2	3	3		3	3	1	3	1	3	1	2		4

Content	Hours
Unit 1: Python Basics, Control Structures and Functions Introduction to Python, Python installation, **IDEs** like IDLE, PyCharm, Jupyter Notebook, Colab, Python syntax, iindentation, keywords and Comments, Variables, data types, type casting, **Basic Input/Output operations:** input(), print(), Basic Operators, **Conditional Statements:** if, if-else, if-elif-else; **Looping Constructs:** for, while; **Loop control statements:** break, continue, pass; Range function, nested loops; Introduction to functions, def keyword; **Function arguments:** positional, keyword, default, variable-length; Return statements; Recursion and use-cases; Anonymous (lambda) functions; **Scope of variables:** local vs global, global keyword	8
Unit 2: Built-in Data Structures in Python **Lists:** declaration, indexing, slicing, common list methods; **Tuples:** immutable sequences, operations, tuple unpacking; **Dictionaries:** key-value pairs, adding/removing elements, traversing; **Sets:** creating sets, set operations (union, intersection, difference); **Nested Data Structures:** lists of dictionaries, dictionaries of lists; List Comprehensions and Dictionary Comprehensions, **Strings** and string operations	8
Unit 3: Object-Oriented Programming in Python **OOP Concepts:** class, object, attributes, methods; **Constructor** (__init__) and **Destructor** (__del__); Instance vs class variables; **Inheritance:** single and multilevel; Method overriding and super(); **Encapsulation:** public, private, protected members; **Polymorphism** and Duck Typing, **Special methods:** __init__, __str__, __len__, etc.	8
Unit 4: Working with Files, Modules and Packages **File Operations:** opening/closing files using open() and with statement; **File modes:** r, w, a, rb, wb; **Reading/Writing Text Files:** read(), readline(), readlines(); **Writing** using write() and writelines(); **Exception Handling:** try, except, else, finally blocks; Catching specific exceptions, using raise keyword, **Importing and using modules:** import, from, as; **Standard Python modules:** math, datetime, os, random, sys; Creating and importing user-defined modules; Exploring Python Package Index	8

(PyPI); Installing packages using pip (pip install)	
Unit 5: Introduction to NumPy Introduction to NumPy, advantages over lists; Creating arrays: array(), arange(), linspace(); Array attributes and operations; Indexing, slicing, reshaping; Mathematical and statistical operations on arrays; Broadcasting and vectorized operations	6
Unit 6: Data Visualization using Python Introduction to data visualization; Matplotlib: line plot, bar chart, scatter, histogram; Plot customization: labels, legends, styles; Subplots and multiple plots; Seaborn basics: countplot, boxplot, heatmap; Integration with NumPy or sample datasets	7

- **Reference Books:**

1. "Core Python Programming" by R. Nageswara Rao, Dreamtech Press
2. "Python Programming: Using Problem Solving Approach" by Reema Thareja, Oxford University Press
3. "Programming in Python" by T.V. Suresh Kumar, B. Easwar Reddy, Pearson
4. "Let Us Python" by Yashavant Kanetkar, BPB Publications
5. "Python for Data Analysis" by Wes McKinney – O'Reilly Media
6. "Introduction to Machine Learning with Python" by Andreas Müller and Sarah Guido – O'Reilly Media

- **Online References:**

Online Resources No.	Website address
1	https://www.w3schools.com/python/ - W3Schools Python Tutorial
2	https://www.geeksforgeeks.org/python-programming-language/ - GeeksforGeeks Python
3	https://www.learnpython.org/
4	https://docs.python.org/3/ - Python Official Documentation
5	https://realpython.com/ - Real Python Tutorials
6	https://numpy.org/doc/ - NumPy Documentation

7	https://matplotlib.org/stable/contents.html - Matplotlib Documentation
8	https://seaborn.pydata.org/ - Seaborn Documentation

Evaluation Scheme:

Assessment	Total Marks	Intended course learning outcomes to be assessed (Please tick as appropriate)					
		CO1	CO2	CO3	CO4	CO5	CO6
IPE	**50**	√	√	√	√	√	√
ESPE	**50**	√	√	√	√	√	√
Total	**100**						

Suggestive Formative Assessment Tools/Methods for IPE
(Minimum 3 and Max. 5 tools)

Formative Assessment Tools/Methods	Total Marks	Course Learning Outcomes to be assessed *(Please tick as appropriate)*					
		CO1	CO2	CO3	CO4	CO5	CO6
Assessment 1 – Lab Assignments	**50**	√	√	√	√	√	√
Assessment 2 – Mini Project		√	√	√	√	√	√
Assessment 3 – Quizzes		√	√	√	√	√	√
Assessment 4 – Oral Viva		√	√	√	√	√	√
Assessment 5 – Midterm Practical Test		√	√	√			

Course Plan

Course Title: Frontend Forge	
Course Code: 25MCA1P207	**Semester: II**
Teaching Scheme: L-T-P: 1-0-2	**Credits: 2**
Evaluation Scheme: IPE: 20	**ESPE Marks: 30**

Course Description:

This course introduces students to **modern front-end web application development** using **JavaScript, Bootstrap, and React**. It begins with essential JavaScript concepts and responsive UI design using Bootstrap, followed by an in-depth study of **React's component-based architecture**. The course emphasizes **hands-on development**, enabling students to build interactive, scalable, and responsive **Single Page Applications (SPAs)**.

Course Objectives:

1. To provide fundamental JavaScript skills and responsive UI design using Bootstrap.
2. To introduce React and component-based development for modern web applications.
3. To develop skills in managing state, events, and forms in React applications.
4. To enable the design of Single Page Applications using React Hooks and routing.

Course Outcomes (COs):

By the end of the course, the student will be able to:

CO1	Apply JavaScript, DOM manipulation, and Bootstrap to develop responsive web interfaces.
CO2	Create reusable UI components using React functional components and props.
CO3	Implement state management, event handling, conditional rendering, and forms in React.
CO4	Develop structured Single Page Applications using React Hooks and client-side routing.

Pre-requisite:	Basic knowledge of HTML, CSS, and JavaScript.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	2	2	2	3	3	-	2	-	-	-	1	-	2	1	1	3
CO2	2	2	3	3	2	-	2	2	-	-	1	-	1	2	1	4
CO3	3	2	3	3	3	-	3	2	1	-	2	-	2	2	2	5
CO4	3	3	3	3	3	-	3	2	1	-	2	-	2	2	3	5

Content	Hours
Unit 1: JavaScript Fundamentals & UI Framework (Bootstrap) • **JavaScript Basics:** Functions and Arrow Functions Arrays and Objects • **DOM & Event Handling:** DOM Structure and Element Selection Event Handling (click, submit, change) Basic Form Validation using JavaScript • **Bootstrap Fundamentals:** Introduction to Bootstrap Bootstrap Grid System (Container, Row, Columns) Responsive Breakpoints • **Bootstrap Components & Customization:** Navbar, Buttons, Forms, Cards, Alerts, Modals Utility Classes (Spacing, Alignment, Display) Customizing Bootstrap using CSS	**8**
Unit 2: React Fundamentals (Component-Based UI Design) • **Introduction to React:** React Overview and Features Single Page Application (SPA) Concept Virtual DOM React Environment Setup and Project Structure • **JSX and Rendering:** JSX Syntax and Rules Embedding JavaScript Expressions in JSX Rendering Elements and Components • **Functional Components:** Creating Functional Components Component Reusability and Composition • **Props, Lists and Keys:** Passing Data using Props Rendering Lists using map() Importance of Keys	**6**

Unit 3: React State, Events and Forms • **State Management:** State Concept in React useState Hook State Updates and Multiple State Variables Props vs State • **Event Handling in React:** Handling Events (onClick, onChange, onSubmit) Passing Parameters to Event Handlers • **Conditional Rendering:** if-else Rendering Ternary Operator Logical AND Rendering • **Forms and Controlled Components:** Controlled Components Handling Form Inputs Basic Form Validation in React	**8**
Unit 4: React Hooks, Routing and Application Structure • **React Hooks:** Introduction to Hooks and Rules of Hooks useEffect Hook (Side Effects, API Calls) useRef Hook (Basic Usage) • **Component Lifecycle using Hooks:** Mounting, Updating and Unmounting Phases • **Routing in React:** Need for Routing in SPA React Router Basics BrowserRouter, Routes, Route Link, NavLink and URL Parameters • **Component Nesting & Project Structure:** Parent-Child Components Passing Data between Components Basic Folder Structure and Best Practices	**8**

- **Reference Books**

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and Ajax, Black Book – Kogent Learning Solutions Inc., Dreamtech Press
2. Web Designing and Development – Rajiv Chopra, S. Chand Publishing
3. Web Designing using HTML, CSS, Bootstrap and JavaScript – G. R. Hari, McGraw Hill Education India
4. Bootstrap: Responsive Web Development – Jake Spurlock, Shroff Publishers / O'Reilly (Indian Edition)

5. Learning React: Functional Web Development with React and Redux – Alex Banks & Eve Porcello, Shroff Publishers / O'Reilly Media (Indian Edition)
6. ReactJS By Example – Building Modern Web Applications with React – Vipul A. M. & Prathamesh Sonpatki, BPB Publications
7. Web Programming: Building Internet Applications – Chris Bates, Wiley India
8. React – Up & Running: Building Web Applications – Stoyan Stefanov, O'Reilly Media
9. Pro React 16 – Adam Freeman, Apress
10. Fullstack React: The Complete Guide to ReactJS and Friends – Accomazzo, Murray, Hernandez, Fullstack.io

- **Online References:**

Online Resources No.	**Website address**
1	https://www.w3schools.com/
2	https://reactjs.org/
3	https://getbootstrap.com/
4	https://www.freecodecamp.org/
5	https://developer.mozilla.org/
6	https://www.javascript.info/

Evaluation Scheme:							
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)					
		CO1	**CO2**	**CO3**	**CO4**		
IPE	**20**	√	√	√	√		
ESPE	**30**	√	√	√	√		
Total	**50**						

Suggestive Formative Assessment Tools/Methods for IPE *(Minimum 3 and Max. 5 tools)*							
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*					
		CO1	**CO2**	**CO3**	**CO4**		
Assessment 1 – Lab Assignments	**20**	√	√	√	√		
Assessment 2 – Mini Project		√	√	√	√		
Assessment 3 – Quizzes		√	√	√	√		
Assessment 4 – Practical Viva Voce		√	√	√	√		

Course Title: Generative AI	
Course Code: 25MCA1L209	**Semester:II**
Teaching Scheme:L-T-P:2-0-0	**Credits:2**
Evaluation Scheme : ISE+MSE Marks:25+25	**ESE Marks : -**

Course Description:

This course provides foundational and practical knowledge of Generative Artificial Intelligence (GenAI), covering its core concepts, prompt engineering techniques, Natural Language Processing (NLP), and ethical considerations. It introduces students to state-of-the-art generative models such as GPT and Gemini, and equips them with the skills to design prompts, process text data, fine-tune models, and evaluate societal implications of AI.

Course Objectives:

1. Understand the evolution and key differences between traditional AI and Generative AI.
2. Explore and implement effective prompt engineering strategies.
3. Apply basic NLP techniques and fine-tune language models for specific applications.
4. Evaluate the ethical and social impacts of Generative AI in real-world contexts.

Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:

CO1	Understand fundamental concepts of Generative AI, including its history, evolution, and key models such as GPT and Gemini.
CO2	Apply prompt engineering techniques by designing effective prompts using zero-shot, one-shot, and few-shot methods.
CO3	Demonstrate proficiency in core NLP techniques and describe or apply fine-tuning processes for generative models.
CO4	Critically analyze the ethical implications and future societal impact of Generative AI technologies.

Prerequisite:	Basic knowledge of Artificial Intelligence concepts and familiarity with Python programming.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs			BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	1	1	2	2	1	2	1	1	1	1	1	2	2	2	2
CO2	2	2	2	3	2	-	2	1	-	-	-	-	2	3	2	3
CO3	2	2	3	3	3	-	2	1	-	-	-	-	3	3	3	3
CO4	1	2	1	1	2	3	3	2	1	2	1	3	2	2	2	4

Content	Hours
Unit 1: Introduction to Generative AI Introduction to Artificial Intelligence, Concept of Generative AI, Differences between AI and Generative AI, History, **Text-to-Text Generative AI Models:** Introduction to models like **GPT-3.5** and **GPT-4** (Generative Pre-Trained Transformer). Introduction to **Google Gemini** (the successor to Bard).	5
Unit 2: Prompt Engineering Concept of Prompt , Types: Zero short, **One-shot**, and **Few-shot**, **Prompt Writing**: Explain prompt writing, **General Rules for Prompt Writing,** Prompt Pattern, Prompt techniques, Prompt Engineering: Benefits key elements and Techniques for Prompt Engineering.	7
Unit 3: Natural Language Processing (NLP) & Fine-Tuning What is **Natural Language Processing (NLP)?** Core NLP Processing Steps: Tokenization, Stop Word Removal, Stemming or Lemmatization, Text Representation. Application of NLP: Text Classification, Text Generation and Sentiment Analysis. Introduction to Fine-Tuning, Need for Fine-Tuning, **Fine-Tuning Process,** Fine-Tuning Approaches.	8
Unit 4: Generative Models and Ethical Considerations and Future of Generative AI What are generative models? Generative Models Architecture: GAN, VAE, Transformers. Potential applications and impact on society, Ethical considerations (bias, misinformation, etc.), Privacy and security concerns ,Discussing the future of AI(Job displacement vs creation, New roles and skills requirements)	7

Reference Books:

1. **Life 3.0: Being Human in the Age of Artificial Intelligence** – Max Tegmark, Paperback Publication, 2018.
2. **Generative AI with TensorFlow 2** – Joseph Babcock, Raghav Bali, Paperback Publication, 2021.
3. **Introduction to AI and Generative AI for Novice** – Adam Neural, Paperback Publication, 2023.

Online References :

Online Resources No.	Website address
1	https://www.deeplearning.ai/courses/generative-ai-for-everyone/
2	https://www.coursera.org/learn/introduction-to-generative-ai
3	https://www.w3schools.com/gen_ai/gen_ai_prompt_intro.php
4	https://www.tutorialspoint.com/prompt_engineering/prompt_engineering_introduction.htm
5	https://www.youtube.com/@AI.Overpowered

Evaluation Scheme:					
Assessment	**Total Marks**	**Intended course learning outcomes to be assessed** (Please tick as appropriate)			
		CO1	**CO2**	**CO3**	**CO4**
ISE	**25**	√	√	√	√
ISE	**25**	√	√	√	√
Total	**50**				

Suggestive Formative Assessment Tools/Methods for ISE *(Minimum 3 and Max. 5 tools)*					
Formative Assessment Tools/Methods	**Total Marks**	**Course Learning Outcomes to be assessed** *(Please tick as appropriate)*			
		CO1	**CO2**	**CO3**	**CO4**
Assessment 1: Open Book Assignment – Compare traditional AI vs. Generative AI, highlighting key differences, advantages, and limitations.	**50**	√	√		

Assessment 2: Prompt Design Task – Hands-on activity where students write zero-shot, one-shot, and few-shot prompts for a given problem.			√	√	
Assessment 3: Practical NLP Task – Apply basic NLP preprocessing steps (tokenization, stop word removal, etc.) on sample text data using any Python-based tool.				√	
Assessment 4: Presentation on Ethical Considerations – Group presentation on ethical issues in generative AI like bias, hallucinations, job displacement, etc.					√
Assessment 5: Mini Project / Tool Demo – Students demonstrate a fine-tuning approach or a basic prototype using models like GPT or Gemini (can be guided by tools like Google Colab, Hugging Face, etc.)		√	√	√	√