MASTER
OF
COMPUTER APPLICATION

Specialization

In

Artificial Intelligence & Machine Learning (AIML)

Programme Code: MCA AIML
Duration: 2 Years

EFFECTIVE FROM SESSION: 2025-2026

CBCS

Department of Computer Science & Information Technology
Faculty of Engineering & Technology

CHHATRAPATI SHIVAJI MAHARAJ UNIVERSITY PANVEL, NAVI MUMBAI

MCA 1 Year AIML - Semester 1										
Course Code	**Course Title**	**Hours/ Week**			**Theory Marks**		**Practical Marks**		**Total Marks**	**Credit**
		L	**T**	**P**	**IA**	**ESE**	**IA**	**ESE**		
CSEM1010	Advanced Data Structure	3	1		30	70			100	4
CSEM1020	Python Programming	3			30	70			100	3
CSEM1030	High Performance Networks	3			30	70			100	3
CSEM1040	IT in Management	3	1		30	70			100	4
CSEM1050	Research Methodology & IPR	3	1		30	70			100	4
CSEM1060	Introduction to Artificial Intelligence	3	1		30	70			100	4
CSEM1011	Advanced Data Structure Lab			4			15	35	50	2
CSEM1021	Python Programming Lab			4			15	35	50	2
	TOTAL	**18**	**4**	**8**	**180**	**420**	**30**	**70**	**700**	**26**

Course Title	Advanced Data Structure	**Course Code:** CSEM1010	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To teach efficient storage mechanisms of data for easy access.
2. To design and implementation of various basic and advanced data structures and algorithm analysis
3. To introduce various techniques for representation and analysis of the data in the real world.
4. To develop applications using data structures and algorithms and analysis.
5. To improve the logical ability.

Detailed Syllabus:

Unit-I

Introduction to Data Structures & Algorithms Introduction of Data structures, Abstract Data Types, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations (Big O, Omega, Theta), Performance measurement, Divide and Conquer, Backtracking Method, Dynamic programming Sorting: Merge sort, Heap sort

Unit-II

Hashing Different Hashing Techniques, Address calculation Techniques, Common hashing functions, Collision resolution techniques: Linear probe, Quadratic probe, Key offset. Arrays and List: Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementation as Linked list, Circular linked List, Doubly linked list, Applications of linked list. Rehashing, Double hashing, Link list addressing.

Unit-III

Linear Data Structures

Stack Definition, Operations, Implementation of Stacks (Array and Linked list) and applications Evaluation of postfix expression, Balancing of parenthesis Queue: Definition, Operations, Implementation of simple queue (Array and Linked list) and applications of queue-BFS Types of queues: Circular, Double ended, Priority, Implementation using linked list Types of Linked List: Singly, Doubly and Circular Linked list Definition, Operations (Insert, delete, traverse, count, search) Applications of Linked List: Polynomial Addition and Subtraction.

Unit-IV

Non-linear Data Structures

Tree Definition and concepts, General Tree- Definition, Insertion and Deletion into general tree, Binary Tree- Definition, Insertion and Deletion into binary tree, Traversal of a binary tree, Reconstruction of a binary tree from traversal, Conversion of general tree into binary tree, Huffman tree, Expression tree, Binary threaded tree Binary Search Tree- Definition, Operation, Implementation AVL tree- Definition, AVL tree rotation with examples, Heaps-Definition, Operations (insertion, delete, build) M way Tree Introduction, B tree-definition and examples and B*

Unit-V

Graphs Definition, Types, Operations, Representation, Networks, Traversals of graph, Minimum spanning tree, Kruskal‟s Algorithm, Prim‟s Algorithm, Warshall's Algorithm, Shortest path algorithm-dijkstra's algorithm

Text /Reference Books:

1. Richard F Gilberg Behrouz A Forouzan , "Data Structure A Pseudocode Approach with
2. C". Second edition University of Mumbai, MCA Sem I and Sem II Rev. 2016-17 3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to ALGORITHMS", PHI, India Second Edition.
3. Shaum‟s Outlines Data Structure Seymour Lipschutz TMH
4. Michael T.Goodrich "Data Structures and Algorithms in C++-" Wiley Publications

Course Outcomes:

1. CO1: Earn the basic types for data structure, implementation and application.
2. CO2: Know the strength and weakness of different data structures.
3. CO3:Demonstrate the appropriate data structure in the context of the solution of a given problem.
4. CO4:Evaluate the appropriate searching & sorting technique in given problem.
5. CO5: Develop programming skills which require solving a given problem

Course Title	Python Programming	**Course Code:** CSEM1020	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To introduce the fundamentals of Python and its syntax for problem-solving.
2. To apply data structures and modular programming using Python.
3. To implement object-oriented concepts for building structured applications.
4. To develop basic web applications using Python web frameworks.
5. To use Python libraries for data analysis and machine learning tasks.

Detailed Syllabus:

Unit-I

Basics of Python Programming : Introduction to Python: Features, Applications. Installation, IDEs (IDLE, Jupyter, VS Code),Variables, Data Types, Type Conversion, Operators and Expressions, Conditional Statements (if, if-else, elif),Looping Statements (for, while),Break, Continue, Pass.

Unit-II

Data Structures and Functions in Python : Lists, Tuples, Sets, Dictionaries: Creation, Access, Methods. List and Dictionary Comprehensions, Defining and Calling Functions, Function Arguments and Return Values, Recursion, Lambda Functions, Built-in Functions: map(), filter(), reduce(), zip(), enumerate().

Unit-III

Object-Oriented Programming with Python : Introduction to OOP Concepts, Classes and Objects, Constructors (__init__), Destructors, Types of Variables and Methods, Inheritance: Single, Multilevel, Multiple, Method Overriding and Polymorphism, Encapsulation and Abstraction.

Unit-IV

Python for Web Development : Introduction to Flask or Django Framework, HTTP Methods and Routing, Creating Web Pages with HTML Templates, Form Handling and Session Management, Database Connectivity using SQLite / MySQL**.**

Unit-V

Python for Data Analysis and Machine Learning : NumPy: Arrays, Indexing, Operations, Pandas: Series, Data Frames, Data Manipulation, Data Visualization: Matplotlib, Seaborn, Introduction to Machine Learning.

Text /Reference Books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly.
3. Think Python, Allen Downey, Green Tea Press
4. Core Python Programming, W.Chun, Pearson
5. Introduction to Python, Kenneth A. Lambert, Cengage

Course Outcomes:

CO-1: Demonstrate proficiency in Python programming constructs and control structures.

CO2: Apply Python's built-in data structures and functions for modular and efficient code.

CO3: Design object-oriented applications using Python's class-based features.

CO4: Develop and deploy basic web applications using Flask or Django.

CO5: Analyze data and implement machine learning models using Python libraries like NumPy, Pandas, and scikit-learn..

Course Title	High Performance Networks	**Course Code:** CSEM1030	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Teach basic concepts in high performance networking, with a focus on throughput and latency performance metrics;
2. Expose students to real-world architectural constraints in high performance networking;
3. Develop design skills through the practical development of a high performance network device;
4. Provide research skills for characterization and modelling of high performance network devices.

Detailed Syllabus:

Unit-I

INTRODUCTION Review of OSI, TCP/IP; Multiplexing, Modes of Communication, Switching, Routing. SONET – DWDM – DSL – ISDN – BISDN,ATM.

Unit-II

MULTIMEDIA NETWORKING APPLICATIONS

Streaming stored Audio and Video – Best effort service – protocols for real time interactive applications – Beyond best effort – scheduling and policing mechanism – integrated services – RSVP- differentiated services.

Unit-III

ADVANCED NETWORKS CONCEPTS

VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN.MPLS -operation, Routing, Tunneling and use of FEC, Traffic Engineering, MPLS based VPN, overlay networks-P2P connections.

Unit-IV

TRAFFIC MODELING

Little's theorem, Need for modeling , Poisson modeling and its failure, Non - poisson models, Network performance evaluation.

Unit-V

NETWORK SECURITY AND MANAGEMENT

Principles of cryptography – Authentication – integrity – key distribution and certification – Access control and: fire walls – attacks and countermeasures – security in many layers. Infrastructure for network management – The internet standard management framework – SMI, MIB, SNMP, Security and administration – ASN.1

Text /Reference Books:

1. J.F. Kurose & K.W. Ross,"Computer Networking- A top down approach featuring the internet", Pearson, 2nd edition, 2003.
2. Walrand .J. Varatya, High performance communication network, Morgan Kauffman – Harcourt Asia Pvt. Ltd. 2nd Edition, 2000.
3. LEOM-GarCIA, WIDJAJA, "Communication networks", TMH seventh reprint 2002.
4. Aunurag kumar, D. MAnjunath, Joy kuri, "Communication Networking", Morgan Kaufmann Publishers, 1ed 2004.
5. Hersent Gurle & petit, "IP Telephony, packet Pored Multimedia communication Systems", Pearson education 2003.
6. Fred Halsall and Lingana Gouda Kulkarni,"Computer Networking and the Internet" fifth edition, Pearson education
7. Nader F.Mir ,Computer and Communication Networks, first edition. 8. Larry l.Peterson & Bruce S.David, "Computer Networks: A System Approach"- 1996

Course Outcomes:

After completion of this subject students will be able to

CO1: Recall Basics of Computer Networking
CO2: Explore Real-Time Interactive Applications
CO3: Summarize advanced network concepts
CO4: Analyze various network models
CO5: Apply network security in various layers of network

Course Title	IT in Management	**Course Code:** CSEM1040	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Explain systems and management concepts and their relevance for information systems 2. Understand the importance and the need for professionalism in managing computer-based systems 3. Explain the strategic use of information technology and the effect of advances in telecommunications and other equipment
4. Discuss the need for special types of MIS and describe their components
5. Describe the issues of planning the development of computer-based applications

Detailed Syllabus:

Unit-I

Introduction: Management Concept and Nature –Types of Managers- Responsibilities and skills of Professional Manager- Functions of Management–Fayol's Principles of Management – Administration vs. Management– Management Process – Levels of Management – Approaches to the study of Management.

Unit-II

Planning and Organizing Planning: Concept, Meaning and Definition, Process, Benefits and Limitations-Decision making: Concept, process & techniques- Departmentation: Concept- Basis of Power and Authority: Concept-Delegation and Decentralization: Concept and Definition, Importance and Limitations, Process – Line and Staff Organization – Conflicts between Line and Staff – Measures to overcome the Conflicts –Span of Control.

Unit-III

Motivation and Leadership: Motivation Concept and Definition, Types, Importance –Theories of Motivation – Motivators: Financial and Non financial- Leadership: Concept and Definition, Importance, Styles of Leadership, Theories of Leadership Leader vs. Manager.

Unit-IV

Communication and Control: Communication Concept and Definition, Importance, Process, Barriers to Effective Communication and Measures to Overcome Communication barriers- Controlling: Concept, Definition, Basic control process, Requirement of Effective control, Control Techniques.

Unit-V

Organizational Behaviour, Change and Development Concept, Meaning, Definition, Objectives, Importance and Limitations of OB – Interdisciplinary approach to Organizational Behaviour- Organizational Change: Concept, Objectives, Reasons, Resistance to change, Measures to overcome change- Organizational Development: Concept, Process, Techniques of OD.

Text /Reference Books:

1. L.M.Prasad, Principles and Practice of Management, 7Ed, S.Chand Publishers, 2007. 2. Weihrich&Koonty, Essentials of Management, TMH, 1990.
3. Robbins.P, Essential of Organizational Behaviour, 10 Ed, PHI, 2010.
4. Fred Luthans, Organizational Behaviour, 11Ed, TMH, 2006.
5. K.Aswathappa, Organizational Behaviour, 5Ed, Himalaya Publishers, 2001.
6. Sridharan Bhat, Management and Behavioural Process, Text and Cases, Himalaya Publishers.

Course Outcomes:

CO1: Understand the concept of Business, Administration, Business management

CO2: Learn how to design, implement and evaluate business projects with the help of IT.

CO3: Interpret the concept, definition, theories, and leadership tackle common practical financial problems of business.

CO4: Examine the ability to carry out market research projects

CO5: Evaluate written sales plans and professional interactive presentations

Course Title	Research Methodology & IPR	**Course Code:** CSEM1050	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Identify an appropriate research problem in their interesting domain.
2. Understand ethical issues, understand the Preparation of a research project thesis report.
3. Understand the Preparation of a research project thesis report.
4. Understand the law of patent and copyrights.
5. Understand the Adequate knowledge on IPR.

Detailed Syllabus:

Unit-I

Meaning of Research Problem Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problems, data collection, analysis, interpretation, Necessary instrumentations.

Unit-II

Literature Studies Effective literature studies approaches, analysis Plagiarism, and Research ethics.

Unit-III

Technical Writing Effective technical writing, how to write reports, Paper Developing a Research Proposal. Format of research proposal, a presentation and assessment by a review committee.

Unit-IV

Research Proposal Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit-V

PATENT RIGHTS AND NEW DEVELOPMENTS IN IPR

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text /Reference Books:

- Stuart Melville and Wayne Goddard, " Research methodology: an introduction for science & engineering students"
- Stuart Melville and Wayne Goddard, " Research methodology: an introduction for science & engineering students"
- Ranjit Kumar, 2nd Edition, " Research Methodology: A Step by Step Guide for beginners"

Course Outcomes:

After completion of this subject students will be able to

CO1: Understand the concept research, scope of research, objective of Research.

CO2: Learn literature study and analyze Plagiarism.

CO3: Interpret and apply the knowledge to write a research paper, project report and presentation project.

CO4: Examine Intellectual Property, Copyrights, innovation, Patents..

CO5: Understand developments in IPR.

Course Title	Introduction to Artificial Intelligence & Machine Learning	**Course Code:** CSEM1060	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Understand the foundational concepts of Artificial Intelligence (AI) and Machine Learning (ML).
2. Learn various problem-solving techniques used in AI.
3. Understand the mathematical and statistical foundations behind ML algorithms.
4. Explore supervised, unsupervised, and reinforcement learning methods.
5. Gain hands-on experience with AI/ML tools and real-world applications.

Detailed Syllabus:

Unit-I

Introduction to Artificial Intelligence: Definition and history of AI Applications of AI: Healthcare, Finance, Robotics, etc., Types of AI: Narrow, General, and Super AI Intelligent agents and environments, Problem-solving: Search strategies (uninformed and informed), Game playing and adversarial search (e.g., Minimax)

Unit-II

Introduction to Machine Learning: Definition and scope of ML, ML vs AI vs Deep Learning, Categories of ML: Supervised, Unsupervised, Reinforcement Learning, Steps in a typical ML pipeline, Evaluation metrics: Accuracy, Precision, Recall, F1-Score

Unit-III

Supervised Learning: Linear Regression and Logistic Regression, Decision Trees and Random Forests, Support Vector Machines (SVM), k-Nearest Neighbours (k-NN), Naive Bayes Classifier, Overfitting, Underfitting, and Regularization

Unit-IV

Unsupervised Learning and Clustering: Introduction to clustering-Means and Hierarchical Clustering, Dimensionality Reduction: PCA, t-SNE, Association Rule Learning: Apriori, FP-Growth, Applications in customer segmentation, anomaly detection

Unit-V

Advanced Topics and Tools: Introduction to Neural Networks and Deep Learning, Basics of Reinforcement Learning, Ethics in AI and ML: Bias, Fairness, and Explainability, Popular ML libraries and tools: Scikit-learn, TensorFlow, Kera's, PyTorch,AIML project lifecycle and deployment basics.

Text /Reference Books:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson
2. Tom M. Mitchell, *Machine Learning*, McGraw Hill
3. Aurelian Gerona, *Hands-On Machine Learning with Scikit-Learn, Kera's, and TensorFlow*, O'Reilly
4. Ian Goodfellow et al., *Deep Learning*, MIT Press

Assignments:

1.Image Classifier with Teachable Machine

- Tool: Google Teachable Machine
- Steps:
  - Collect webcam images (e.g., objects like pen, bottle).
  - Train image classification model.
  - Test real-time predictions.
- Learning Outcome: Understand classification and supervised learning.

https://youtu.be/6YFvMeVi3Uc

2. Customer Segmentation with Orange

- Tool: Orange Data Mining (GUI tool)
- Steps:
  - Load dataset (e.g., Mall Customers).
  - Apply k-Means Clustering.
  - Visualize groups.
- Learning Outcome: Learn clustering and unsupervised learning.

https://youtu.be/dJ5z2SRwzgs

3. To implement a supervised machine learning algorithm for sentiment prediction using text data

1. Import necessary libraries
2. Load the labeled text dataset (e.g., reviews, tweets)
3. Preprocess the text data (lowercase, remove punctuation, etc.)
4. Convert text to numerical features
5. Split the dataset into training and testing sets
6. Train a classification model (e.g., Logistic Regression or SVM)
7. Make predictions on the test set
8. Evaluate model performance using accuracy, precision, recall, etc.

Course Outcomes:

CO1: Understand fundamental concepts and history of Artificial Intelligence.

CO2: Analyze and implement basic AI problem-solving strategies.

CO3: Distinguish between different types of Machine Learning and evaluate their applications.

CO4: Apply supervised learning algorithms for classification and regression tasks.

CO5: Apply unsupervised learning techniques for clustering and dimensionality reduction.

Course Title	Advanced Data Structure Lab	**Course Code:** CSEM1011	
Teaching Scheme		**Evaluation Scheme**	
Practicals	**4 Hrs Week**	**Internal Assessment Test**	**15 Marks**
Total Credits	**2**	**End-Semester Examination**	**35 Marks**

Course Objectives:

Implement the following using C/C++/Java

1. Write a program to perform the following operations on a singly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal.

2. Write a program to perform the following operations on a doubly linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways

3. Write a program that implements stack (its operations) using i) Arrays ii) linked list 4. Write a programs that implements Queue (its operations) using i) Arrays ii) linked list 5. Write a C program that implements the Quick sort method to sort a given list of integers in ascending order.

6. Write a C program that implements the Merge sort method to sort a given list of integers in ascending order. 7. Write a C program that implements the SHELL sort method to sort a given list of integers in ascending order.

8. Write a program to perform the following: i) Creating a Binary Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

9. Write a C program to perform the following: i) Creating a AVL Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

10. Write a C program that uses functions to perform the following: i) Creating a Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

11. Write a C program to perform the following: i) Creating a B-Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

12. Write a program that implements Kruskal's algorithm using a disjoint set data structure. The program takes as input a file (data.txt), in which each line either represents a vertex or an edge. For the edge lines, the first integer on that line represents the starting vertex, the second the ending vertex, and the third the weight of the edge. Use this file to construct, line by line, the graph upon which Kruskal's algorithm will be run (do NOT hardcode this graph!).

13. Write a program to simulate various graph traversing algorithms.

14. Write a program to find the minimal spanning tree of a graph using the Prim's algorithm. The program should be able to read in the weight matrix of a graph and produce the minimal spanning tree Generate weight matrices (using a random number generator) with a large number of nodes and estimate the time complexity of the algorithm.

15. Write a program to find the closest pair of points using a divide and conquer strategy. Use the random number generator to generate a large number of points in a unit square as input to the algorithm. Test the correctness of the algorithm by using a brute force method.

16. Use dynamic programming to find the optimal binary search tree for a given set of numbers together with their probabilities. Remember that the numbers may be generated in any order, so a presorting step is also required.

Course Outcomes:

At the end of the course, a student will be able to

CO1: Implement List ADTs and their operations.

CO2: Develop programs for sorting.

CO3: Develop programs for implementing trees and their traversal operations.

CO4: Implement graph traversal algorithms.

CO5: Apply algorithm design techniques.

Course Title	Python Programming Lab	**Course Code:** CSEM1021	
Teaching Scheme		**Evaluation Scheme**	
Practicals	**4 Hrs Week**	**Internal Assessment Test**	**15 Marks**
Total Credits	**2**	**End-Semester Examination**	**35 Marks**

Course Objectives:

1. To introduce basic programming concepts using Python such as variables, control structures, functions, and data types.
2. To develop problem-solving skills through hands-on implementation of logic using Python syntax and libraries.
3. To train students in modular and structured programming, including use of functions, recursion, and file handling.
4. To expose students to object-oriented programming principles using Python's class and object mechanisms.
5. To provide practical knowledge of Python libraries used in data handling, file I/O, and basic computational tasks.

Name of Experiment

SR. No	Python Programming Lab
1.	Basic Python Syntax and Control Statements **Aim**: To understand variables, data types, conditional statements, and loops. **Tools**: Jupyter Notebook / VS Code.
2.	Data Structures – Lists, Tuples, Sets, Dictionaries. **Aim**: To explore Python's core data structures. **Tools**: Jupyter Notebook / VS Code.
3.	Functions and Recursion **Aim**: To define and call functions, and implement recursion. **Tools**: Jupyter Notebook / VS Code
4.	Lambda and Built-in Functions **Aim**: To use lambda, map, filter, reduce, zip, enumerate. **Tools**: Jupyter Notebook / VS Code
5.	Classes and Objects **Aim**: To implement classes, constructors, and object creation. **Tools**: Jupyter Notebook / VS Code

6.	Inheritance and Polymorphism **Aim**: To demonstrate single/multilevel inheritance and method overriding. **Tools**: Jupyter Notebook / VS Code
7.	Web App Using Flask **Aim:** To create a basic Flask web application with routing. **Tools:** Flask, VS Code
8.	Form Handling in Flask with SQLite **Aim**: To create a form and store data in a database. **Tools:** Flask + SQLite
9.	Data Analysis with NumPy and Pandas **Aim:** To manipulate arrays and data frames. **Tools:** Jupyter Notebook, NumPy, Pandas

Course Outcomes:

CO1:Apply fundamental programming concepts in Python to solve basic computational problems.
CO2:Write efficient Python code using control structures, functions, and loops for structured problem-solving.
CO3:Manipulate strings, lists, tuples, dictionaries, and sets to implement data-driven logic.
CO4:Develop Python programs using OOP features such as classes, inheritance, and polymorphism.
CO5:Use Python's built-in libraries for tasks such as file operations, basic data analysis, and error handling.

MCA 1 Year AIML - Semester 2										
Course Code	**Course Title**	**Hours/ Week**			**Theory Marks**		**Practical Marks**		**Total Marks**	**Credit**
		L	**T**	**P**	**IA**	**ESE**	**IA**	**ESE**		
CSEM2010	Advanced Operating System	3			30	70			100	3
CSEM2020	Web Technology	3	1		30	70			100	4
CSEM2030	Cyber & Information Security	3	1		30	70			100	4
CSEM2040	Advanced Database Management System	3			30	70			100	3
CSAM2050	Design and Analysis of Algorithm	3	1		30	70			100	4
CSAB2060	Applied Machine Learning	3	1		30	70			100	4
CSEM2021	Web Technology Lab			4			15	35	50	2
CSEM2041	Advanced Database Management System Lab			4			15	35	50	2
	TOTAL	**18**	**4**	**8**	**180**	**420**	**30**	**70**	**700**	**26**

Course Title	Advanced Operating System	**Course Code:** CSEM2010	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

The aim of this module is to study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems); Hardware and software features that support these systems.

Detailed Syllabus:

Unit-I

Introduction and Process Management Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S. Process Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Preemptive, Non preemptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Unit-II

Concurrency control Concurrency
Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization: Readers Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill.

Unit-III

Memory Management
Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging Virtual Memory: Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

Unit-IV

I/O management & Disk scheduling and Inter Process Communication

I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache. Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter-process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization.

Unit-V

Multi-Processor Based and Virtualization Concepts

Virtual machines; supporting multiple operating systems simultaneously on a single hardware platform; running one operating system on top of another. Reducing the software engineering effort of developing operating systems for new hardware architectures. True or pure virtualization. Para virtualization; optimizing performance of virtualization system; hypervisor call interface.

Text /Reference Books:

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918 .
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons , Inc., 9th Edition, 2016, ISBN 978-81-265-5427-0 3. Andrew Tannenbaum, Operating System Design and Implementation, Pearson, 3rd Edition. 4. D.M Dhamdhere, Operating Systems: A Concept Based Approach, Mc-Graw Hill

❖ Maurice J. Bach, “Design of UNIX Operating System”, PHI
❖ Achyut Godbole and Atul Kahate, Operating Systems, Mc Graw Hill Education, 3rd Edition ❖ The Linux Kernel Book, Remy Card, Eric Dumas, Frank Mevel, Wiley Publications.

Course Outcomes:

After completion of this subject students will be able to

CO1: Understand the design approaches of advanced operating systems.

CO2: Analyze the design issues of distributed operating systems

CO3: Evaluate design issues of multiprocessor operating systems.

CO4: Analyze the requirements of the Distributed File System and Distributed Shared Memory.

CO5: Formulate the solutions to schedule the real time applications

Course Title	Web Technology	**Course Code:** CSEM2020	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. This Subject is useful for Making own Web page and how to host your own website on the internet.
2. Along with that Students will also learn about the protocols involved in internet technology

Detailed Syllabus:

Unit-I

Introduction to WWW

Protocols and programs, secure connections, application and development tools, the web browser, what is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP Web Design: Web site design principles, planning the site and navigation.

Unit-II

Introduction to HTML and Style sheets

The development process, Html tags and simple HTML forms, web site structure Introduction to XHTML : XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside the browser. Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2.

Unit-III

Javascript

Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition

Javascript and objects, Javascript own objects, the DOM and web browser environments, forms and validations DHTML : Combining HTML, CSS and Javascript, events and buttons, controlling your browser, Ajax: Introduction, advantages & disadvantages ,Purpose of it ,ajax based web application, alternatives of ajax.

Unit-IV

XML

Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

Unit-V

PHP

Starting to script on server side, Arrays, function and forms, advance PHP Databases : Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs.

Text /Reference Books:

1. Ralph Moseley, M.T. Savliya, “Developing Web Applications", Willy India, Second Edition, ISBN: 978-81-265-3867-6
2. “Web Technology Black Book”, Dremtech Press, First Edition, 978-7722-9973 Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.

3.http://www.ebooksbucket.com/uploads/itprogramming/javascript/Learning_PHP _MyS Q L_Javascript_CSS_HTML5 Robin_Nixon_3e.pdf

4. Dana Moore, Raymond Budd, Edward Benson,Professional Rich Internet Applications: AJAX and Beyond Wiley publications. https://ebooks-it.org/0470082801-ebook.htm 5. Alex Banks and Eve Porcello, Learning React Functional Web Development with React and Redux,OREILLY, First Edition

Course Outcomes:

After completion of this subject students will be able to

CO1: Create web pages using the HTML and CSS features with different layouts as per need of applications.

CO2: Apply server-side scripting with PHP to generate the web pages dynamically using the database connectivity.

CO3: Create simple web pages in PHP and to represent data in XML format.

CO4: Understand the JavaScript to develop the dynamic web pages.

CO5: Create the databases to connect with the webpages.

Course Title	Cyber & Information Security	**Course Code:** CSEM2030	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To learn foundations of Cyber Security and Ethical Hacking analysis using programming languages like python.
2. To learn various types of algorithms and its applications of Cyber Security and Ethical Hacking using forensic detection
3. To learn python toolkit required for programming Cyber Security, Ethical Hacking concepts.
4. To understand the concepts of Cyber Security, Ethical Hacking, Forensic detection image processing, pattern recognition, and natural language processing.
5. To identify insights on how to apply Cyber Security, Ethical Hacking to solve interdisciplinary problems.
6. To acquire the hands-on skills and the knowledge required for job competency.

Detailed Syllabus:

Unit-I

Foundations of. Cyber Security Concepts and Cryptography and Cryptanalysis

Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning).Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners. Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application LayerPGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec

Unit-II Infrastructure and Network Security

Python programming environment Overview. Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

Unit-III

Cyber Security Vulnerabilities& & Guards

Internet Security, Cloud Computing & Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment. Open Source/ Free/ Trial Tools: WinAudit, Zap proxy (OWASP), burp suite, DVWA kit. Hands on project and mini project.

Unit-IV

Security in Evolving Technology

Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Open Source/ Free/ Trial Tools: adb for android, xcode for ios, Implementation of REST/ SOAP web services and Security implementations Reviews and Conclusion.

Unit-V

Cyber Laws and Forensics

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013. Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management of Crime Sense, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations.

Text /Reference Books:

1. William Stallings, “Cryptography and Network Security”, Pearson Education/PHI, 2006.
2. V.K. Jain, “Cryptography and Network Security”, Khanna Publishing House. 3. Gupta Sarika, “Information and Cyber Security”, Khanna Publishing House, Delhi. 4. Atul Kahate, “Cryptography and Network Security”, McGraw Hill.
5. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning
6. Nina Godbole, “Information System Security”, Wiley
7. Bothra Harsh, “Hacking”, Khanna Publishing House, Delhi
8. The basic of Hacking and Penetration testing ,second edition on ethical hacking and penetration by Patrick Engebretson
9. The web application hackers handbook and LAB manual by Wiley

Course Outcomes:

After completion of this subject students will be able to

CO1: Understand system security goals and concepts, classical encryption techniques and acquire fundamental knowledge.
CO2: Understand, DOS/ DDOS attacks and Asset Management and Audits, Vulnerabilities.
CO3: Apply different message digest and digital signature algorithms to verify integrity and achieve authentication and design secure applications.
CO4: Understand the basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc.
CO5: Analyze and apply system security concept and Cyber Security Standards to recognize malicious code.

Course Title	Advanced Database Management System	**Course Code:** CSEM2040	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Introduce the students to applications of systems designed to manage the data resources of organizations.
2. To enable design of high-quality relational databases and database applications.
3. To enable design of high-quality relational databases and database applications.

Detailed Syllabus:

Unit-I

Introduction & Overview of SQL

Introduction & Overview of SQL: Data Independence, Architecture of DBMS, Data Models, SQL data types and literals, Types of SQL commands: DDL, DML, TCL, DCL, SQL Operators, and Constraints.

Unit-II

Data modeling using the Entity Relationship Model

ER model concepts, Types of Relationships, notation for ER diagr:am, Reduction of ER-Diagrams to Relational Model, mapping constraints, Generalization, Aggregation, Specialization, Extended ER model, relationships of higher degree.

Unit-III

Normalization and Functional Dependency

Normalization; Normal Forms i. First Normal Form (1NF) ii. Second Normal Form (2NF) iii. Third Normal Form (3NF). Basics of Functional Dependency; Functional dependency diagram and examples; Full function dependency (FFD); Lossy Decomposition; Lossless join decomposition; Dependency Preserving Decomposition.

Unit-IV

Transaction Management

Transactions: Concepts, ACID Properties, States of Transaction, Serializaibility, Conflict & View Serializable Schedule.

Unit-V

Advanced SQL and PL / SQL

Characteristics of SQL, Tables, views and indexes, Constraints Group By and Having Clause, Order By Clause, Queries and subqueries, Aggregate Functions, Numeric Functions, String Functions, Date & Time Functions, Insert, Update and Delete operations, Unions, Intersection, Minus, Joins: Equi-Join, Natural Join, Self Join, Inner Join, Outer Join.

PL/SQL Basics, Blocks, Architecture, Variables, Constants, Attributes, Character Set, Data Types, Conditional Statements, Iteration, Cursors, Exceptions, Triggers, Procedures and Functions

Text /Reference Books:

1. Thomas Connolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management, Addison Wesley , 5th Edition, 2010.

2. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill, 3rd Edition, Jan 2007.

3. Date C J, "An Introduction to Database System", Addision Wesley, 8th Edition 2003.

4. Bipin C. Desai, "An Introduction to Database Systems", Galgotia Publication, Revised Edition, 2010.

5. Majumdar & Bhattacharya, "Database Management System", TMH, 2005.

6. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fourth Edition, McGraw Hill, 2002.

7. N.Tamer Ozsu, Patrick Valduriez, "Principles Of Distributed Database Systems", Prentice Hall International Inc., 1999.

8. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill,

Course Outcomes:

After completion of this subject students will be able to

CO1: Execute various advance SQL queries related to Transaction Processing & Locking.
CO2: Demonstrate use of Database Object, Procedures & Functions; Packages.
CO3: Implement Armstrong's Axioms for functional dependencies.
CO4: Understand Functional Dependency and Functional Decomposition.
CO5: Apply various Normalization techniques and transaction concepts; Concurrency; Methods for Concurrency control.

Course Title	Design and Analysis of Algorithm	**Course Code:** CSEM2050	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

Study the concepts of fundamentals of algorithm, Analysis of algorithm efficiency, Brute force techniques, Divide-and-Conquer, Decrease-and-Conquer, Greedy techniques.

Detailed Syllabus:

Unit-I

Introduction What is an Algorithm? Fundamentals of Algorithmic problem solving, Important problem types. Fundamental data structures.

Unit-II

Fundamentals of the Analysis of Algorithm Efficiency
Analysis Framework, Measuring the input size, Units for measuring Running time, Orders of Growth, Worst-case, Best-case and Average-case efficiencies, Asymptotic Notations and Basic Efficiency classes, Informal Introduction, O-notation, Ω-notation, θ-notation, mathematical analysis of non-recursive algorithms, mathematical analysis of recursive algorithms.

Unit-III

Brute Force & Exhaustive Search
Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential search, Exhaustive Search- Travelling salesman Problem and Knapsack Problem, Depth First Search, Breadth First Search.

Unit-IV

Divide-and-Conquer
Introduction, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties.

Unit-V
Decrease-and-Conquer & Greedy Technique Decrease-and-Conquer: Introduction, Insertion Sort, Topological Sorting. Greedy Technique: Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.
Text /Reference Books:
1. Introduction to the Design and Analysis of Algorithms, 3rd edition, Anany Levitin, Pearson Publication, ISBN: 9789332583771 2. Design & Analysis of Algorithms, S. Nandagopalan, Sapna Book House.
Course Outcomes:
CO1: Discuss about the various problem types and algorithms CO2: Demonstrate to Analyze Analyze Framework and the notation. CO3: Test to analyze the different algorithm design techniques for a given search. CO4: Critically analyze the different Divide-and-Conquer properties. CO5: Construct to Modify existing algorithms to improve efficiency.

Course Title	Applied Machine Learning	**Course Code:** CSEM2060	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To understand the foundational concepts and types of machine learning algorithms (supervised, unsupervised, and reinforcement learning) and their appropriate use cases.
2. To apply data preprocessing, feature engineering, and model selection techniques using real-world datasets to build effective ML models.
3. To implement machine learning algorithms using open-source libraries and platforms such as scikit-learn, TensorFlow, Keras, or AutoML tools.
4. To evaluate and optimize machine learning models using metrics like accuracy, precision, recall, F1-score, ROC-AUC, and perform hyperparameter tuning.
5. To develop and deploy end-to-end machine learning applications that address domain-specific problems in fields like finance, healthcare, marketing, and cybersecurity.

Detailed Syllabus:

Unit-I

Introduction to Machine Learning:
Overview of Human Learning and Machine Learning, Types of Learning, Applications of Machine Learning, Tools and Technology for Machine Learning.
Overview of Probability:
Statistical tools in Machine Learning, Concepts of probability, Random variables, Discrete distributions, Continuous distributions, Multiple random variables, Central limit theorem, Sampling distributions, Hypothesis space and inductive bias, Evaluation and Cross Validation, Hypothesis testing, Monte Carlo Approximation

Unit-II

Classification and Regression: Supervised Learning vs Unsupervised Learning, Supervised Learning, Classification Model, Learning steps, Classification algorithm, Clustering, Association rules, Linear Regression, Multivariate Regression, Logistic Regression

Unit-III

Neural Networks-Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation

Unit-IV

Foundations of neural networks and deep learning, Techniques to improve neural networks: Regularization and optimizations, hyperparameter tuning and deep learning framework (Tensorflow and Keras.), Convolutional Neural Networks, its applications, Recurrent Neural Networks and its applications**.**

Unit-V

Bayesian Concept Learning: Impotence of Bayesian methods, Bayesian theorem, Bayes' theorem and concept learning, Bayesian Belief Network, Generative Adversarial Networks, Deep Reinforcement Learning, Adversarial Attacks

Text /Reference Books:

1. Machine Learning, Saikat Dull, S. Chjandramouli, Das, Pearson
2. Pattern Recognition and Machine Learning, by Christopher Bishop
3. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (freely available online)
4. Machine Learning with Python for Everyone, Mark E. Fenner, Pearson
5. Deep Learning: Methods and Applications, Li Deng and Dong Yu

Assignments

1. **Supervised Learning - Classification (Decision Trees & k-NN)**

- **Objective**: Train and evaluate classifiers on labeled datasets.
- **Activities**: Apply decision tree and k-NN on UCI datasets; evaluate with confusion matrix.
- **Tools**: scikit-learn, Weka

2. **Unsupervised Learning - Clustering (K-means, DBSCAN)**

- **Objective**: Perform clustering and analyze the results.
- **Activities**: Cluster data and visualize results with elbow plot and silhouette score.
- **Tools**: Weka

3. **Neural Network for Handwritten Digit Recognition using Keras (MNIST Dataset)**

- Import required libraries (TensorFlow, Keras, etc.)
- Load the dataset (e.g., MNIST)
- Preprocess the data (normalize, one-hot encode labels)
- Initialize the neural network model
- Add input, hidden, and output layers
- Compile the model (define optimizer, loss function, metrics)
- Train the model using training data with validation split

Course Outcomes:

After completion of this subject students will be able to

CO1: Explain the fundamental concepts of machine learning, types of learning paradigms, and the role of probability and statistical tools in machine learning.
CO2: Apply supervised learning techniques including classification and regression models to real-world datasets using appropriate tools.
CO3: Analyze the structure and learning mechanisms of neural networks and evaluate model performance using parameter estimation techniques.
CO4: Design and implement deep learning models using CNNs and RNNs, and optimize performance through hyperparameter tuning and regularization techniques.
CO5: Evaluate advanced machine learning approaches such as Bayesian learning, GANs, and reinforcement learning, and identify their applications and limitations..

Course Title	Web Technology Lab	**Course Code:** CSEM2021	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**4 Hrs Week**	**Internal Assessment Test**	**15 Marks**
Total Credits	**2**	**End-Semester Examination**	**35 Marks**

Course Objectives:

1. To provide fundamental knowledge of web development technologies such as HTML, CSS, JavaScript, and their roles in building static and dynamic web pages.
2. To introduce server-side programming concepts using languages like PHP, Node.js, or Python, enabling students to build interactive and data-driven web applications.
3. To develop the ability to design and deploy web applications that include both front-end and back-end integration using open-source technologies.
4. To familiarize students with modern web development frameworks and tools, such as Bootstrap for responsive design, and databases like MySQL or MongoDB for backend storage.
5. To cultivate skills in web hosting, domain management, and web security, preparing students for real-world deployment and maintenance of web-based systems.

Detailed Syllabus:

1. Write an HTML code to display your education details in a tabular format.
2. Write an HTML code to display your CV on a web page.
3. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
4. Write an HTML code to create a login form. On submitting the form, the user should get navigated to a profile page.
5. Write an HTML code to create a Registration Form. On submitting the form, the user should be asked to login with these new credentials.
6. Write an HTML code to create your Institute website, Department Website and Tutorial website for specific subjects.
7. Write an HTML code to illustrate the usage of the following:

   ●Ordered List · Unordered List · Definition List

8. Write an HTML code to create a frameset having header, navigation and content sections. 9. Write an HTML code to demonstrate the usage of inline CSS.

10. Write an HTML code to demonstrate the usage of internal CSS. 11.Write an HTML code to demonstrate the usage of external CSS.

11. Write a Java script to prompt for the user's name and display it on the screen. 13.Design HTML form for keeping student record and validate it using Java script.

12. Write an HTML program to design an entry form of student details and send it to a database server like SQL, Oracle or MS Access.

13. Write programs using Java script for Web Page to display browsers information. 14. Create an applet which will have a line, an Oval & a Rectangle

15. Writing a program in XML and creating a style sheet in CSS & displaying the document in internet explorer.

16. Write an XML program to display products

17. Write a program using PHP and HTML to create a form and display the details entered by the user.

Course Outcomes:

1. CO1: Develop web pages using HTML, DHTML and Cascading Styles Sheets
2. CO2: Develop a dynamic web pages using JavaScript (client side programming)
3. CO3: Develop a Program using XML, Ajax, and PHP.
4. CO4: Develop pages using suitable client side and server side web technologies.
5. CO5: Develop the PHP programs to store records in database.

Course Title	Advanced Database Management System Lab	**Course Code:** CSEM2041	
Teaching Scheme		**Evaluation Scheme**	
Practicals	**4 Hrs Week**	**Internal Assessment Test**	**15 Marks**
Total Credits	**2**	**End-Semester Examination**	**35 Marks**

Course Objectives:

1. To provide hands-on experience with advanced database concepts such as query optimization, indexing, and transaction management using SQL and PL/SQL.
2. To enable students to implement complex queries and stored procedures using triggers, functions, cursors, and views for robust database applications.
3. To explore and apply NoSQL database technologies such as MongoDB or Cassandra for handling unstructured and semi-structured data.
4. To expose students to real-time database environments by designing ER models and implementing normalized schemas for scalable applications.
5. To develop skills in integrating databases with applications using backend connectivity and database programming tools (e.g., JDBC, Python-DB API).

1. Draw E-R diagrams and convert entities and relationships to relation tables for a given

scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg.

bank, college) 2. Write relational algebra queries for a given set of relations.

3. Perform the following: a. Viewing all databases, Creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)
4. Perform the following: a. Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.
5. For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause
6. For a given set of relation tables perform the following a. Creating Views (with and without check option), Dropping views, Selecting from a view
7. Write a Pl/SQL program using FOR loop to insert ten rows into a database table.
8. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.
9. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates

how a banking debit transaction might be done.

10. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.

Course Outcomes:

At the end of the course, Students can able to

CO1: Analyze a given database application scenario to use ER model for conceptual design of the database.

CO2: Apply SQL to find solutions to a broad range of queries.

CO3: Apply normalization techniques to improve database design.

CO4: Demonstrate use of Database Object.

CO5: Develop application program using PL/SQL.

MCA 2 Year AIML - Semester III										
Course Code	**Course Title**	**Hours/ Week**			**Theory Marks**		**Practical Marks**		**Total Marks**	**Credit**
		L	**T**	**P**	**IA**	**ESE**	**IA**	**ESE**		
ITEM3440	Software Project Management	3			30	70			100	3
CSAM3050	Deep Learning & Neural Networks	3	1		30	70			100	4
CSAM3060	Text Analytics using NLP	3	1		30	70			100	4
	(Elective-1)	3	-		30	70			100	3
CSAM3040	Advance Computer Network	3			30	70			100	3
CSAM3063	Project I			8			30	70	100	4
CSAM3075	Seminar-I			4			15	35	50	2
CSAM3041	Advance Computer Network Lab			4			15	35	50	2
	TOTAL	15	2	16	150	350	60	140	700	25

Elective-I (Any one)

CSEM3540	Machine Learning and Pattern Recognition	3								3
CSAM3630	Reinforcement Learning	3								3
CSAM3730	Blockchain	3								3

Course Title	Software Project Management	**Course Code:** ITEM3440	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To understand the Software Project Planning and Evaluation techniques.
2. To plan and manage projects at each stage of the software development life cycle (SDLC).
3. To learn about the activity planning and risk management principles.
4. To manage software projects and control software deliverables.
5. To deliver successful software projects that support organization‘s strategic goals.

Detailed Syllabus:

Unit-I

Project Evaluation and Project Planning

Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

Unit-II

Project Life Cycle and Effort Estimation

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

Unit-III

Activity Planning and Risk Management

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning – Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

Unit-IV

Project Management and Control

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

Unit-V

Software Projects

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Text /Reference Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References:

1. Robert K. Wysocki ―Effective Software Project Management‖ – Wiley Publication, 2011. 2. Walker Royce: ―Software Project Management‖- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects‖ – McGraw Hill Education (India), Fourteenth Reprint 2013.

Course Outcomes:

CO1: Understand Project Management principles while developing software. CO2: Recall, Understand & Apply about the basic project management concepts, framework and the process models.
CO3: Understand the software process models and software effort estimation techniques and Apply in Software project management.
CO4: Estimate the risks involved in various project activities.
CO5: Define & Apply the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.

Course Title	Deep Learning & Neural Networks	**Course Code:** CSAM3050	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To provide foundational knowledge of deep learning concepts, architectures, and training techniques, enabling learners to understand and apply neural networks to solve non-linear classification problems.
2. To introduce the architecture, functioning, and training of Convolutional Neural Networks, enabling students to apply CNNs effectively in computer vision tasks using modern frameworks like TensorFlow.
3. To introduce recurrent architectures for sequence modeling, including LSTM and GRU, and to equip students with skills to analyze and implement RNN-based solutions for sequential data problems.
4. To introduce students to the concepts and architecture of Generative Adversarial Networks, enabling them to understand, build, and apply GANs for real-world data generation tasks.
5. To introduce the architecture, working, and training of autoencoders, and to explore their relationship with GANs and hybrid generative models.

Detailed Syllabus:

Unit-I

Fundamentals of Neural Networks: basic concepts of neural networks and their biological inspiration. architecture of artificial neurons, activation functions, and feedforward neural networks. supervised and unsupervised learning, gradient descent optimization, and loss functions. perceptron models, multilayer perceptrons (MLPs), and backpropagation algorithms.

Unit-II

Deep Neural Networks and Training Techniques: deep feedforward networks, hyperparameter tuning, and challenges in training deep models such as vanishing/exploding gradients and overfitting. optimization algorithm including Adam. batch normalization, dropout regularization, weight initialization strategies, and learning rate schedules are discussed for effective training of deep neural networks.

Unit-III

Convolutional Neural Networks (CNNs): architecture of CNNs, and design of convolutional layers. Popular models such as LeNet, AlexNet, VGGNet, and ResNet are studied. use of CNNs in real-world applications such as image classification, object detection, and face recognition.

Unit-IV

Recurrent Neural Networks (RNNs) and Variants: architecture of simple RNNs, backpropagation through time (BPTT), and vanishing gradient issues. Advanced variants such as Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) networks are introduced. Applications include time series forecasting, speech recognition, and natural language processing.

Unit-V

Generative Models and Advanced Deep Learning: autoencoders and their variants (denoising, variational), generative adversarial networks (GANs), and transfer learning. The use of pre-trained models for solving real-world problems is emphasized. current trends in deep learning, such as attention mechanisms and transformer architectures in vision and NLP.

Text /Reference Books:

TEXT BOOKS:

1. Deep Learning: An MIT Press Book by Ian Goodfellow and Yoshua Bengio Aaron Courville.
2. Michael Nielson, Neural Networks and Deep Learning, Determination Press,2015.
3. Satish Kumar, Neural networks: A classroom Approach, Tata McGraw-Hill Education, 2004.

REFERENCES:

1. Deep Learning with Python, Francois Chollet, Manning publications, 2018
2. Advanced Deep Learning with Keras, Rowel Atienza, PACKT Publications, 2018

Assignments:

Assignment 1: Image Classification using Deep Neural Network in Keras

Objective:
Build and train a simple deep neural network to classify handwritten digits using the MNIST dataset.

Tools Used:

- Python
- TensorFlow + Keras (Open-source)

Course Outcomes:
CO1: Understand the basic concepts and techniques of Deep Learning and the need of Deep Learning techniques in real-world problems. **CO2:** Understand CNN algorithms and the way to evaluate performance of the CNN architectures. **CO3:** Apply RNN and LSTM to learn, predict and classify the real-world problems in the paradigms of Deep Learning. **CO4:** Understand, learn and design GANs for the selected problems. **CO5:** Understand the concept of Auto-encoders and enhancing GANs using autoencoders

Course Title	Text Analytics and Natural Language Processing	**Course Code:** CSAM3060	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 /1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To introduce the core concepts of natural language processing and text analytics.
2. To provide knowledge of preprocessing and feature extraction techniques.
3. To train students in building NLP models for real-world applications.
4. To develop practical skills using open-source NLP tools and libraries.
5. To explore modern approaches in deep learning-based NLP.

Detailed Syllabus:

Unit-I

Introduction to NLP and Text Processing: text analytics, focusing on the types and formats of text data such as structured, semi-structured, and unstructured text. importance of text encoding formats like ASCII and Unicode. preprocessing steps including tokenization, stop word removal, stemming, and lemmatization, using open-source libraries like NLTK and spaCy.

Unit-II

Syntax and Structure: parts-of-speech (POS) tagging, chunking, and Named Entity Recognition (NER) to identify important components in text. The use of regular expressions for pattern matching and text extraction.parsing techniques, including both constituency and dependency parsing, are introduced using tools such as spaCy and NLTK. extracting grammatical structure and meaningful patterns from sentences.

Unit-III

Feature Engineering and Vectorization: transforming textual data into numerical formats suitable for machine learning models. vectorization methods such as Bag of Words (BoW) and Term Frequency-Inverse Document Frequency (TF-IDF). word embeddings using Word2Vec, GloVe, and FastText for capturing semantic relationships between words. Dimensionality reduction techniques like PCA and t-SNE are discussed for visualizing high-dimensional text data. Tools used include scikit-learn and Gensim.

Unit-IV

Text Classification and Sentiment Analysis: text classification tasks such as spam detection and topic classification. Naive Bayes, Support Vector Machines (SVM), and Logistic Regression. Lexicon-based and machine learning-based sentiment analysis techniques implemented using tools like TextBlob and VADER. unsupervised learning techniques: topic modeling using Latent Dirichlet Allocation (LDA) for discovering hidden themes in large text corpora.

Unit-V

Advanced NLP with Transformers: advancements in NLP using deep learning-based transformer models. architecture and applications of models like BERT and GPT. pre-trained language models for tasks such as question answering, text summarization, and machine translation.

Text /Reference Books:

Daniel Jurafsky & James H. Martin: *Speech and Language Processing* (3rd Edition, Draft Version) Pearson Education, A comprehensive and foundational text covering both statistical and deep learning approaches to NLP., Free online draft available

Steven Bird, Ewan Klein, and Edward Loper, *Natural Language Processing with Python* O'Reilly Media, A practical guide to NLP using Python and NLTK; excellent for lab work and beginners. Free online version available

Jason Brownlee
Deep Learning for Natural Language Processing
Machine Learning Mastery, Focuses on using deep learning techniques like LSTM, CNN, and word embeddings with Keras.

Assignments:

1. **Text Preprocessing and Word Cloud Visualization**
   - Tools: Python (Jupyter Notebook or Google Colab), `nltk`, `wordcloud`, `matplotlib`
   - Dataset: Sample customer reviews or tweets (CSV or plain text)

2. **Named Entity Recognition using spaCy**
   - **Tools**: spaCy, Python, Google Colab
   - **Dataset**: News headlines or Wikipedia text

Course Outcomes:

CO1:Apply fundamental NLP techniques such as tokenization, stemming, lemmatization, and POS tagging to process and analyze raw text data.
CO2:Implement vectorization methods and word embeddings to convert text into numerical representations suitable for machine learning models.
CO3:Develop and evaluate classification models and sentiment analysis systems using supervised and unsupervised learning algorithms on textual datasets.
CO4:Use open-source tools and libraries (like NLTK, spaCy, scikit-learn, Gensim, Hugging Face) for building and deploying text analytics solutions.
CO5:Analyze and solve real-world problems in NLP using advanced methods including topic modeling, NER, and transformer-based language models like BERT.

Elective - I			
Course Title	Machine Learning and Pattern Recognition	**Course Code:** CSAM3540	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms.
2. To understand and apply the basic methods of feature extraction, feature evaluation, and data mining.
3. To understand and apply both supervised and unsupervised machine learning algorithms to detect and characterize patterns in real-world data.
4. To develop prototype pattern recognition algorithms that can be used to study algorithm behavior and performance against real-world multivariate data.
5. To understand the complexity of machine learning algorithms, their limitations and open- issues.

Detailed Syllabus:

Unit - I

Introduction
Basic definitions; Hypothesis space and inductive bias; Data cleaning; Data transformation; Evaluation; Model Visualization; Cross-validation; Linear Regression.

Unit - II

Feature Extraction
Curse of dimensionality, Principal component analysis; Fisher linear discriminant, Feature extraction from multivariate data, image data, Feature evaluation

Unit - III

Non-parametric
Methods for Pattern Non-numeric data or nominal data, Linear regression, Decision tree algorithms: ID3, C4.5, Classification and Recognition: Regression Trees (CART); Overfitting and underfitting.

Unit - IV

Bayes Learning and Parametric Estimation Methods Maximum-Likelihood estimation; Maximum a posteriori estimation; Naïve Bayes and Bayesian classifiers; K-nearest neighbor method; Support Vector Machines; Algorithms for clustering: K-means, Hierarchical and other methods.

Unit - V

Ensemble Classifiers Algorithmic Performance Evaluation Need and usefulness of ensemble classifiers; Bagging; Boosting, Random forests; Decorate; Vote; Stacking. Analysis of classification, clustering, prediction, association algorithms; Approaches of parameter tuning.

Text Books:

1. T. Mitchell, Machine Learning, McGraw Hill.
2. M. Gopal, Applied Machine Learning, McGraw Hill.

Reference Books:

1. A. Ethem, Introduction to Machine Learning, PHI Learning Pvt. Ltd.
2. M. Evangelia, Supervised and Unsupervised Pattern Recognition, CRC Press.
3. C. Bishop, Neural Networks for Pattern Recognition, Oxford University Press.
4. G. James, D. Witten, T. Hastie, R. Tibshirani, Introduction to Statistical Learning, Springer.

Course Outcomes:

After the completion of the course, student will be able to

CO1: Understand the fundamentals of pattern recognition and machine learning. CO2: Understand the issue of dimensionality and apply suitable feature extraction methods considering the characteristics of a given problem.
CO3: Apply parametric and non-parametric methods for pattern recognition in real-world problems.
CO4: Create solutions to real-world problems using pattern recognition and machine intelligence algorithms.
CO5: Analyze the performance of machine learning algorithms, effect of parameters and tuning of parameters.

Elective - I			
Course Title	Reinforcement Learning	**Course Code:** CSAM3630	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To provide an overview of Deep and Reinforcement Learning as a field of study.
2. To explain the fundamental issues and principles in Deep Reinforcement Learning.
3. To Implement and use backpropagation algorithms to train deep neural networks.
4. To Construct and apply on-policy reinforcement learning algorithms with function approximation.
5. To Implement and apply Monte Carlo reinforcement learning algorithms

Detailed Syllabus:

Unit - I

Introduction to Neural Networks; Shallow NeuralNetworks; Deep Neural Networks; Recurrent Neural Networks; Reinforcement Learning; Successful application examples; Fundamental principles and techniques to Deep Learning and Reinforcement Learning.

Unit - II

Deep Feedforward Networks: Example of LearningXOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms; Regularization techniques for deep learning; Optimization forTraining Deep Models.

Unit - III

Convolutional neural networks (CNN): Fundamentals, Properties of CNN representations, Need, Architecture, Building CNN; Sequence Modeling: Recurrent and Recursive Nets, Unfolding Computational Graphs, Deep RecurrentNetworks, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence- to-Sequence Architectures, Recursive Neural Networks, Echo State Networks.

Unit - IV

Fundamentals of Reinforcement Learning; Agent environment framework; Successes of reinforcement learning; Bandit problems and online learning; Markov decision processes; Returns and value functions

Unit - V

Dynamic programming algorithms for reinforcement learning; Monte Carlo methods for reinforcement learning; Temporal-Difference Learning
Fundamentals and applications of Deep Reinforcement Learning; Case studies of deep learning applications; Case studies of reinforcement learning applications; Active research topics in deep and reinforcement learning

Text /Reference Books:

1. I. Goodfellow, Y. Bengio and A. Courville, Deep Learning, MIT Press. 2. R. Sutton and A. Barto Reinforcement Learning: An Introduction, MIT Press.

Reference Books:

1. S. Ravichandiran, Hands-on Reinforcement Learning with Python, Packt Publishing. 2. N. Buduma, N. Locascio, Fundamentals of Deep Learning: Designing Next Generation MachineIntelligence Algorithms, O'Reilly. 3. G. Ciaburro, Keras Reinforcement Learning Projects, Packt Publishing. 4. C. Aggarwal, Neural Networks and Deep Learning: A Textbook, Springer.

Course Outcomes:

After the completion of the course, student will be able to
CO1: Understand the basics of deep learning and reinforcement learning paradigms.
CO2: Apply optimization and regularization techniques to train deep neural networks.
CO3: Construct and train convolutional, recurrent and recursive neural networks.
CO4: Implement and apply reinforcement learning algorithms.
CO5: Analyze real-world problems for solutions using deep and reinforcement learning.

Course Title	Blockchain	**Course Code:** CSAM3730	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To assess blockchain applications in a structured manner.
2. To overcome the problems of centralization using blockchain technology
3. To introduce the concept of Bitcoin & its fundamentals.
4. To make them familiar with the Bitcoin network, payments, clients and APIs.

Detailed Syllabus:

Unit-I

Blockchain, the growth of blockchain technology, distributed systems, the history of blockchain and Bitcoin, types of blockchain. Decentralization, methods of decentralization, routes of decentralization, blockchain and full ecosystem decentralization, smart contracts, Decentralized organizations and platforms for decentralization.

Unit-II

Consensus and multiparty agreements: protocols, Proof of Work, Proof of Stake, Delegated Proof of Stake, Proof of Elapsed Time, Deposit based consensus, Proof of importance. Federated consensus or federated Byzantine consensus, Reputation-based mechanisms, Practical Byzantine Fault Tolerance.

Unit-III

Symmetric Cryptography, working with the OpenSSL command line, cryptographic primitives. Public Key Cryptography, asymmetric cryptography, public and private keys and financial markets and trading.

Unit-IV

Introducing Bitcoin, Bitcoin, digital keys and addresses, transactions, blockchain, mining. Alternative Coins. Limitations of Bitcoin. Bitcoin Network and payments, The Bitcoin network, wallets, Bitcoin

payments, innovation in Bitcoin, Bitcoin Clients and APIs

Unit-V

Hyperledger, Ethereum. Decomposing the consensus process, Hyperledger fabric components, Chaincode Design and Implementation. Blockchain-Outside of Currencies. IPFS protocol and Blockchain. Blockchain Concurrency and scalability. Network models and timing assumptions.

Text /Reference Books:

Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

- Andreas M Antonopoulos, "Mastering Bitcoin: Unlocking digital crypto currencies", ORELLY,2015
- Mastering Blockchain 2nd Edition, Imran Bashir, PACKT Publication.

Course Outcomes:

CO1: Describe the basic concepts and technology used for blockchain
CO2: Describe the primitives of the distributed computing and cryptography related to blockchain.
CO3: Illustrate the concepts of Bitcoin and their usage.
CO4: Implement Ethereum block chain contract.
CO5: Apply security features in blockchain technologies

Course Title	Advance Computer Network	**Course Code:** CSAM3040	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To review the computer networking concepts
2. To impart concepts of advanced computer networking.
3. To introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. To facilitate students in gaining expertise in some specific areas of networking such as the design and maintenance of individual networks.

Detailed Syllabus:

Unit-I

Basic Network Concepts
Introduction to Computer Networks, Element of Network, Type of Network: LAN, MAN, WAN, Network Topologies: Bus, Star, Mesh, Ring, etc, Data communication & Representation, Network Operating System.

Unit-II

Networking Device and media connection
Common LAN Media: STP, UTP, Coaxial Cable, Optical Fiber, Making and Testing Cable, Straight thru cable, Cross over Cable, Connecter, Jack, Patch Panels, NIC, Repeater and Hub & its type, Bridges and its Types, Switch and Router.

Unit-III

Network Model and Bridging/Switching and VLAN
Description of Seven Layers of OSI Model, TCP/IP Model, Comparison of OSI & TCP/IP Model, Physical and Data link Layer, Network and Transport Layer, Presentation and Session Layer, Application Layer.
Concepts Switching Services, Configuration of Switches, Store and Forward Techniques, VLAN Basic, VLAN Membership, Routing between VLAN, Configuration of VLAN Unit.

Unit-IV

Cisco Basics, IOS & Network Basic
Examine Router elements, Router Boot Sequence, Managing configuration of Cisco Router, Basic Cisco IOS command, Prepare the Initial configuration of Router.

Unit-V

Routing Protocol & Network Management Describe the three basic methods used in Networking, Routing Protocol: RIP, IGRP, EIGRP, OSPF, Routing Protocol and configuration, configure standard access list to Filter IP traffic, Monitor and verify selected Access list operation on Router, Troubleshoot Network Basic Problem.

Text /Reference Books:

1. Data and Computer Communication. "William Stallings", Prentice, Hall of India Private Limited.
2. CCNA Cisco certified Network Associate Study Guide by Todd Lammle 5th edition (BPB)
3. Data Communication and Networking 5E Forouzan Behrouz A. McGraw Hill Education (India), New Delhi, 2005, ISBN-13:978-1-25-906475-3
4. Internetworking with TCP/IP, Volume I, Fourth Edition. Comer Douglas E, Prentice Flail of India Private Limited, New Delhi, 2014 ISBN-81-203-2065-4
5. Computer Networks, Fourth Edition Tanenbaum Andrew S. PHI Learning, New Delhi 2014 ISBN-81 -203 -2175-8.
6. Advanced Computer Network B.M. Harwani and DT Editorial Services Dreamtech New Delhi- 2014 ISBN 978-93-5004-013-3
7. Computer Networks Principles, Technologies and Protocols for Network Design Natalia Olifer, Victor Olifer Wiley ISBN.

Course Outcomes:

CO1: Understand the terminology and concepts of TCP-IP reference model and IPV6 message format and its services.

CO2: Acquire the concepts of protocols, network interfaces, and design/performance issues in Local Area Networks and wide area networks.

CO3: Acquire the concepts of Routing Protocol & Network Management.

CO4: Evaluate the performance of TCP/IP over asymmetric networks.

CO5: Identify the different types of network devices and their functions within a network.

Course Title	Project I	**Course Code:** CSAM3063	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**8 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To prepare students to excel in computer applications to succeed in industry/ technical profession.
2. To provide students with a solid foundation in mathematical and computing fundamentals and techniques required to solve related problems and also to pursue higher studies and research.
3. To train students with good computing breadth so as to comprehend, analyze, design and create computing solutions for the real life problems.

Detailed Syllabus:

Projects Steps & Scheduling

? The Master of Computer Applications (MCA) programme prepares the learners to take up positions as Programmers, Systems Analysts, Systems Designers in the field related to computer application and information technology or learners may go for higher studies in this area.

? The theoretical background of various courses provides you the necessary foundation, principles, and practices to develop effective ways to solve computing problems. ? The hands-on experience gained from the practical courses provide you the knowledge to work with various operating systems, programming languages and software tools. ? This project work is kept in the MCA program to give you an opportunity to develop quality software solutions.

? During the development of the project you should be involved in all the stages of the software development life cycle (SDLC) like requirements analysis, systems design, software development/coding, testing and documentation, with an overall emphasis on the development of reliable software systems.

? The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices, and develop a good understanding of SDLC.

? The MCA learners are encouraged to involve themselves completely on the project work in their Fifth semester. It is advised to learners to develop their project for solving problems of the software industry or any research organization.

? Doing this will give more exposure to handling real life problems of project development.

- Learners should take this project work very seriously.
- The project should be genuine and original in nature and should not be copied from anywhere else.
- Learners, who wish to do their Project Report from any organization, are required to take NOC from the concerned organization, to carry out the Code of the Project done.
- The project covers Study of existing system & System Requirements, Analysis, Design and Coding. Learners should submit their Project Reports as per the guidelines.
- Project Reports which are not as per the guidelines will not qualify for evaluation. Objective of the Project

a. To train the learner to independently formulate and solve a social, philosophical, Commercial, or technological problem and present the results in written and oral form. b. To expose learners to the real life problems in the World of Work.

c. To provide opportunities to learners to interact with people and understand human relations.

Apply for Project

Project Scheduling

Learners are supposed to complete their project work within a period of 6 months.

Activity	**Date**
Apply for Project	After completed theory courses of 4st Sem
Submission of Project Proposal	Within one month from apply the project work
Approval of Project work	Within 15 days from submission of project synopsis or proposal.
Start the project	Immediately after approval of project.
Project Reporting	At the end of 5th month from start
Submission of Project Report	On or before 20 days of the end of examination.
Examination of Project Work	Date will be announced by the University.

Course Outcomes:

CO1: Discover potential research areas in the field of IT.
CO2: Conduct a survey of several available literatures in the preferred field of study
CO3: Compare and contrast the several existing solutions for research challenges.
CO4: Demonstrate an ability to work in teams and manage the conduct.
CO5:Formulate and propose a plan for creating a solution for the research plan identified.
CO6: Report and present the findings of the study conducted in the preferred domain.

Course Title	Seminar-1	**Course Code:** CSAM3075	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**4 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**2**	**End-Semester Examination**	**70 Marks**

Course Objectives:

This is a seminar course in which students will give an oral presentation of scientific data. Students attend seminars as well as prepare and present a seminar. The seminar is expected to enhance the student's public speaking skills and to provide experience in the preparation of visuals for scientific presentations. Critique of research objectives and approaches will be gained from audience questions.

Detailed Syllabus:

Seminar Topics:

- Quantum Computing. ...
- Fingerprint Authentication. ...
- HTML HyperText Markup Language. ...
- Pixeom. ...
- Personal Computer and AutoCAD. ...
- Big Data Analysis for Customer Behavior. ...
- FreeNet. ...
- A Secure Dynamic Multi-keyword Ranked Search Scheme over Encrypted Cloud Data.
- Employee Management System. ...
- Hotel Management System. ...
- Network Traffic Management. ...
- GSM Based Remote Switching System. ...
- Cyber and Social Terrorism. ...
- Handwritten Character Recognition: Training a simple NN for classification with MATLAB.

Course Outcomes:

CO1: Analyze technically relevant current topics on computer science/information technology/research
CO2: Understand the analytical approach towards choosing a research paper and acquiring research skill.
CO3: Create technical documents and give oral presentations related to the work completed.
CO4: Understand what constitutes plagiarism and how to use proper citation styles.
CO5:Adhere to ethical standards of research and publication.

Course Title	Advance Computer Network Lab	**Course Code:** CSAM3041	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**4 Hrs Week**	**Internal Assessment Test**	**15 Marks**
Total Credits	**2**	**End-Semester Examination**	**35 Marks**

Course Objectives:

1. To provide an in-depth understanding of advanced networking concepts, protocols, and architectures beyond the basic networking models.
2. To analyze and evaluate the performance of network protocols and their suitability in real-world networking environments.
3. To explore advanced topics such as Quality of Service (QoS), Network Security, Software-Defined Networking (SDN), and IPv6.
4. To enable students to design, configure, and troubleshoot complex network infrastructures using simulation and open-source tools.
5. To foster research and innovation skills in modern networking technologies, trends, and emerging areas such as cloud networking and IoT networking.

Detailed Syllabus:

List of Experiments

1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands.

2. Configuration of IP addressing for a given scenario for a given set of topologies.

3. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address.

4. Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols b. RIP routing protocols c. BGP routing d. OSPF routing protocols e. Static routes (check using netstat)

5. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark characterise traffic when the DNS server is up and when it is down.

6. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client characterise file transfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment.

7. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mail.

8. Implement Open NMS+ SNMPD for checking Device status of devices in community MIB of Linux.

Course Outcomes:

At the end of the course, Students can able to

CO1: Explain the basics of network configuration and management, including the use of CISCO routers and DHCP servers.

CO2: Configure and manage various network protocols (e.g., ARP, RIP, OSPF) and services (e.g., DHCP, DNS, FTP).

CO3: Use diagnostic tools (e.g., Wireshark, tcpdump) to analyze network issues and performance.

CO4: Evaluate the effectiveness and efficiency of their network configurations and protocols.

CO5: Design and implement comprehensive network solutions, such as setting up mail servers and monitoring networks with OpenNMS and SNMPD.

MCA 2 **Year AIML - Semester IV**										
Course Code	**Course Title**	**Hours/ Week**			**Theory Marks**		**Practical Marks**		**Total Marks**	**Credit**
		L	**T**	**P**	**IA**	**ESE**	**IA**	**ESE**		
CSAM4010	Mobile Computing	3	1		30	70			100	4
CSAM4020	Conventional AI Chatbot	3	1		30	70			100	4
	(Elective-II)	3	0		30	70			100	3
CSAM4030	Software Testing	3	1		30	70			100	4
CSAM4063	Major Project			12			50	150	200	6
CSAM4075	Seminar-II			4			15	35	50	2
CSAM4011	Mobile Computing LAB			4			15	35	50	2
	Total	**12**	**3**	**20**	**120**	**280**	**80**	**220**	**700**	**25**

Elective-II										
CSAM4750	Internet Of Things	3								3
CSAM4340	Ethical Hacking and Digital Forensic	3								3

Course Title	Mobile Computing	**Course Code:** CSAM4010	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
2. To explore both theoretical and practical issues of mobile computing.
3. To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Detailed Syllabus:

Unit-I

Introduction to Mobile Computing and GSM Mobile services : Telecommunication Generations, Cellular systems, Electromagnetic Spectrum, Antenna, Signal Propagation, Signal Characteristics, Multiplexing, Spread Spectrum: DSSS & FHSS. System Architecture, Radio interface, Protocols, Localization and Calling, Handover, security (A3,A5 & A8) GPRS system and protocol architecture, UTRAN, UMTS core network; Improvements on Core Network.

Unit-II

Mobile Networking : Medium Access Protocol, Internet Protocol and Transport layer , Medium Access Control: Motivation for specialized MAC, , Introduction to multiple Access techniques (MACA) , Mobile IP: IP Packet Delivery, Agent Advertisement and Discovery, Registration, Tunnelling and Encapsulation, Reverse Tunnelling, Routing (DSDV,DSR) ,Mobile TCP : Traditional TCP, Classical TCP Improvements like Indirect TCP, Snooping TCP & Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/Timeout Freezing, Selective Retransmission.

Unit-III

Wireless Local Area Networks Introduction, Infrastructure and ad-hoc network , IEEE 802.11:System architecture , Protocol architecture , Physical layer, Medium access control layer, MAC management, 802.11a, 802.11b , Wi-Fi security : WEP ,WPA, Wireless LAN Threats , Securing Wireless Networks , HiperLAN 1 & HiperLAN 2 ,Bluetooth: Introduction, User Scenario, Architecture, protocol stack.

Unit-IV

Mobility Management Introduction, IP Mobility, Optimization, IPv6 06, Macro Mobility: MIPv6, FMIPv6, Micro Mobility: CellularIP, HAWAII, HMIPv6.

Unit-V

Long-Term Evolution (LTE) of 3GPP : LTE System Overview, Evolution from UMTS to LTE 10, LTE/SAE Requirements, SAE Architecture, EPS: Evolved Packet System, E-UTRAN, Voice over LTE (VoLTE), Introduction to LTE-Advanced, System Aspects, LTE Higher Protocol Layers, LTE MAC layer, LTE PHY Layer, Self-Organizing Network (SON LTE), SON for Heterogeneous Networks (HetNet), Introduction to 5G.

Text /Reference Books:

1. Jochen Schilller, "Mobile Communication", Addision wisely, Pearson Education
2. William Stallings "Wireless Communications & Networks", Second Edition, Pearson Education 3. Christopher Cox, "An Introduction to LTE: LTE, LTE-Advanced, SAE and 4G Mobile Communications", Wiley publications.
3. Raj Kamal, "Mobile Computing", 2/e, Oxford University Press-New

Course Outcomes:

CO1: Recall basic concepts and principles in computing, cellular architecture.
CO2: Interpret the components and functioning of mobile networking.
CO3: Summarize a variety of security techniques in mobile network.
CO4: Utilize the concepts of WLAN for local as well as remote applications.
CO5: Demonstrate Long Term Evolution (LTE) architecture and its interfaces.

Course Title	Conversational AI (Chatbots)	**Course Code:** CSAM4020	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

4. **To introduce the fundamental concepts of conversational interfaces and dialogue systems**, including types of chatbots, rule-based vs. AI-driven bots, and their applications in various domains.
5. **To develop practical understanding of Natural Language Understanding (NLU)** and dialogue management techniques used to process and respond to user inputs effectively.
6. **To enable students to design, build, and deploy intelligent chatbots** using open-source platforms such as Rasa, Botpress, and Google Dialogflow.
7. **To explore integration techniques of chatbots with messaging platforms, APIs, and backend services** to enable full-stack conversational AI applications.
8. **To expose students to real-world challenges in chatbot development** such as multilingual support, context retention, user intent prediction, and ethical considerations in conversational AI.

Detailed Syllabus:

Unit-I

Introduction to Chatbots and Conversational Interfaces: Chatbot history and evolution, Types of chatbots: Rule-based, AI-based, Hybrid, Applications: Customer service, healthcare, education, e-commerce, Chatbot architecture: NLU, Dialogue Manager, NLG, Overview of chatbot platforms (Dialogflow, Rasa, Watson, Microsoft Bot Framework)

Unit-II

Natural Language Processing for Chatbots: Text pre-processing: Tokenization, Stemming, Lemmatization, POS tagging, Named Entity Recognition (NER), Intent recognition and entity extraction, Word embeddings: TF-IDF, Word2Vec, FastText, BERT, Language models and sequence modeling

Unit-III

Dialogue Management and Chatbot Frameworks: Rule-based vs ML-based dialogue management, Finite State Machines for dialogue flow, Context handling and slot-filling, Introduction to Rasa: NLU, Core, Actions, Stories, Custom actions and forms in Rasa

Unit-IV
Chatbot Integration and Deployment : Backend integration: APIs, Databases, Webhooks, Integrating chatbots with Telegram, WhatsApp, Web Apps, Hosting with ngrok, Heroku, or cloud services, Voice assistants: Alexa Skills, Google Assistant (intro only), Security and privacy in chatbots
Unit-V
Advanced Concepts and Evaluation: Open-domain vs closed-domain bots, Deep Learning for chatbots: Encoder-decoder, Transformers, Generative vs Retrieval-based bots, Introduction to LLM-based bots (e.g., GPT), Evaluation of chatbot performance: Confusion matrix, Accuracy, UX metrics
Text /Reference Books:
4. **"Building Chatbots with Python"** – Sumit Raj, Apress 5. **"Conversational AI"** – Michael McTear, Springer 6. **"Speech and Language Processing"** – Daniel Jurafsky & James H. Martin 7. Rasa Official Documentation: https://rasa.com/docs 8. Google Dialogflow Docs: https://cloud.google.com/dialogflow
Assignments
1. Create simple text based Python GPT Chatbot using OpenAPI : Python, OpenAPI Secrete Key **https://www.youtube.com/watch?v=q5HiD5PNuck** 2. Create & Build simple Chatbot using Python & RASA open source platform **https://www.youtube.com/watch?v=Co7QtrJBkpY**
Course Outcomes:
CO1: Understand the concepts of chatbots and conversational agents. CO2: Explore Natural Language Processing (NLP) techniques for chatbot design. CO3: Develop rule-based and AI-based chatbots. CO4: Use popular frameworks and APIs for chatbot development. CO5: Integrate chatbots with real-time applications.

Elective-II			
Course Title	Internet Of Things	**Course Code:** CSAM4750	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Understand the definition and significance of the Internet of Things
2. Discuss the architecture, operation, and business benefits of an IoT solution.
3. Examine the potential business opportunities that IoT can uncover.
4. Explore the relationship between IoT, cloud computing, and big data Identify how IoT differs from traditional data collection systems.

Detailed Syllabus:

Unit-I

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

Unit-II

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

Unit-III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Unit-IV

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

Unit-V

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text /Reference Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education

2.Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley 2. Getting Started with the Internet of Things CunoPfister , Oreilly

Course Outcomes:

CO1: Familiarize the concepts of IoT and apply IoT to different applications

CO2: Analyze and evaluate the data received through sensors in IoT

CO3: Understand and be able to explain the role of big data, cloud computing and data analytic s in a typical IoT system.

CO4: Identify how IoT differs from traditional data collection systems

CO5: Compare and contrast the use of Devices, Gateways and Data Management in IoT.

Course Title	Ethical Hacking and Digital Forensic	**Course Code:** CSAM4340	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**3**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Learner should learn various aspects of network security
2. Learner should learn different technologies for website security
3. Learner should learn various aspects of mobile security
4. Lerner should learn various forensic methods for identification of fraud.

Detailed Syllabus:

Unit-I

Introduction

Ethical Hacking terminology, Five stages of hacking, Vulnerability Research,Legal implication of hacking, Impact of hacking.

Unit-II

Computer Forensics Technology

Introduction to Computer Forensics, Use of Forensics in Law Enforcement, Employment Proceedings, Computer Forensics services. Types of Computer, Forensics Technology- Military, law, Spyware and Adware, Biometrics security systems. Information gathering Methodologies, Competitive Intelligence, DNSEnumerations, Social Engineering attacks, **Types of Computer Forensics systems,** Internet security, IDS, Firewall, Public key, Net privacy systems, Vendor and computer Forensics services.

Unit-III

Evidence Handling

Introduction to Incident, Incident Response Methodology, Steps, Activities in Initial Response Phase after detection of an incident. **Initial Response and Forensic Duplication:** Initial Response & Volatile Data Collection from Windows system, Initial Response & Volatile Data Collection from Unix system, **Forensic Duplication:** Forensic duplication as Admissible Evidence, ForensicDuplication Tool Requirements, Creating a Forensic Duplicate/Qualified Forensic Duplicate of a Hard Drive. **Storage and Evidence Handling:** File Systems: FAT, NTFS, Forensic Analysis of File systems, Storage Fundamentals: Storage Layer, Hard Drives. Evidence Handling: Types of Evidence, Challenges in evidence handling,

Digital Forensics: Introduction – Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential, Device handling: seizure issues, device identification, networked devices and contamination.

Unit-IV

Network Forensics
Collecting Network Based Evidence, Investigating Routers, Network protocols, Email Tracing, Internet Fraud.

Unit-V

Mobile Phone Forensics Crime and mobile phones, evidence, forensic procedures, files present in SIM card, device data, external memory dump, evidence in memory card, operators systems. Android Forensics: Procedures for handling an android device, imaging android USB mass storage devices, logical and physical techniques. Scanning & Enumeration: Port Scanning, Network Scanning, Vulnerability Scanning, NMAP Scanning tool, OS Fingerprinting, Enumeration. System Hacking: Password cracking techniques, Key loggers, Escalating privileges, Hiding Files, Steganography Technologies, Countermeasures. Sniffers & SQL Injection: Active and passive sniffing, ARP Poisoning, Session Hijacking, DNS Spoofing, Conduct SQL Injection attack, Countermeasures. Systems Investigation and Ethical Issues: Data Analysis Techniques, Investigating Live systems (Windows & Unix), Investigating Hacker Tools, Ethical Issues, Cybercrime. Reconnaissance, Scanning Host discovery, Network devices discovery, service discovery, Backdoors and Trojan horses, Buffer Overflows, Covering Tracks: Networks and systems, Denial of service Attacks, Exploiting system using Netcat, IP address Spoofing, Network Sniffing, Password Attacks, rootkits, Session Hijacking and Defenses.

Text /Reference Books:

1. Kevin Mandia, chirs Proise, “Incident Response and Computer Forensic”

2. Gregory Kipper, “” Wireless Crime and Forensic Investigation”, Auerbach publication, 2007

3. Peter Stepheson,”Investigating Computer Crime: A handbook for corporate investigation”, Sept 1999

- Skoudis E. Perlman R. counter hack: A step by step Guide to Computer Attacks and Effective Defense,Prentice Hall Professional technical Reference, 2001.
- John R Vacca “Computer Forensic ” Second Edition
- Hacker Techniques, Exploits and incident Handling http://www.sans.org

Course Outcomes:

After the completion of the course, student will be able to

CO1: Understand the details steps involved in Ethical Hacking & network security.
CO2: Design and Develop a secure website.
CO3: Understand & Apply details process about evidence handling.
CO4: Identify various security aspects with respect to mobile technology.
CO5: Explain solutions for various case studies with the help of forensic techniques.

Course Title	Software Testing	**Course Code:** CSAM4030	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**3 / 1 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**4**	**End-Semester Examination**	**70 Marks**

Course Objectives:

1. Study importance of Software Testing in Software Development
2. Explore appropriate Software Testing Techniques for finding bugs in Software.
3. Study various Software Testing Tools and Quality Assurance Methods.

Detailed Syllabus:

Unit-I

Introduction Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics

Unit-II

Role of Testing in SDLC Review of software development models (Waterfall Models, Spiral Model, W Model, V Model) Agile Methodology and Its Impact on testing, Test Levels (Unit, Component, Module, Integration, System, Acceptance, Generic)

Unit-III

Approaches to Testing

Static Testing:Structured Group Examinations - Reviews, Static Analysis,Control flow & Data flow, Determining Metrics Dynamic Testing Black Box Testing: Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques White Box Testing:Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage, Advanced White Box Techniques, Instrumentation and Tool Support Gray Box Testing, Intuitive and Experience Based Testing, Regression Testing

Unit-IV

Test Management and Automation

Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation,

Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

Unit-V

Software Quality and Metrics

Five Views of software quality, ISO 9126 Quality Characteristics, ISO 9000:2000 s/w quality std. SQA: organizational Level Initiatives.

Text /Reference Books:

1. Andreas Spillner,Tilo Linz, Hans Schaefer, "Software Testing Foundation"
2. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
3. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
4. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
5. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

Course Outcomes:

CO1: Acquire knowledge of basic principles and knowledge of software testing and debugging and test cases.

CO2: Understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples.

CO3: Understand the various types of testing approaches.

CO4: Analyze the difference between functional testing and structural testing.

CO5: Analyze & Evaluate the performance of fault based testing.

Course Title	Major Project	**Course Code:** CSAM4063	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Practicals	**12 Hrs Week**	**Internal Assessment Test**	**50 Marks**
Total Credits	**6**	**End-Semester Examination**	**150 Marks**

Course Objectives:

To provide knowledge and skills in the various aspects of computer applications and core programming. Students will also be trained in the latest trends of information technology.

Detailed Syllabus:

A project is an inquiry, conducted personally by a trainee(s) who is responsible for using a variety of methods (e.g. analysis, interpretation, planning etc) to undertake a task or study a subject (knowledge or skill or attitude) and to write a report, or solve a problem etc., in line with the objectives of the project. A project can also be termed as an open-ended assignment, the outcome of which is not known at inception and whose progress depends mostly on the intelligence, skills, creativity and energy of the students. The project work exposes the students to real life problems and introduces them to the procedures and practices used in industry. The project work also helps the students to gain confidence in tackling problems of their own. The project work is needed to strengthen and supplement the learning experience of students. Project-based instruction is an authentic instructional model or strategy in which students plan, implement, and evaluate projects that have real-world applications beyond the classroom. Learning activities that are interdisciplinary, long term, and student centred are emphasized, rather than short, isolated lessons. Most important, students find projects fun, motivating, and challenging because they play an active role in choosing the project and in the entire planning process. Teachers are increasingly working with students who have a wide range of abilities, come from various backgrounds. Institutes are seeking ways to respond to the needs of these students. Project-based instruction provides one way to introduce a wider range of learning opportunities into the classroom. It can engage students from diverse backgrounds because students can choose topics that are related to their own experiences, as well as allow them to use individual learning styles.

There are a wide range of project types such as service learning projects, work-based projects, task-oriented projects, problem-solving projects and so forth, but authentic projects all have in common

these defining features:

1) Student centered, student directed

2) A definite beginning, middle, and end

3) Content meaningful to students; directly observable in their environment 4) Real-world problems

5) First hand investigation

6) Sensitivity to local culture and culturally appropriate

7) Specific goals related to curriculum and institute, district, or state standards 8) A tangible product that can be shared with the intended audience 9) Connections among academic, life, and work skills

10) Opportunity for feedback and assessments from expert sources 2 11) Opportunity for reflective thinking and student self-assessment

12) Authentic assessments (portfolios, journals, etc.)

Course Outcomes:

CO1: Discover potential research areas in the field of IT.

CO2: Conduct a survey of several available literature's in the preferred field of study

CO3: Compare and contrast the several existing solutions for research challenges.

CO4: Demonstrate an ability to work in teams and manage the conduct.

CO5:Formulate and propose a plan for creating a solution for the research plan identified.

CO6: Report and present the findings of the study conducted in the preferred domain.

Course Title	Seminar-II	**Course Code:** CSAM4075	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**4 Hrs Week**	**Internal Assessment Test**	**30 Marks**
Total Credits	**2**	**End-Semester Examination**	**70 Marks**

Course Objectives:

This is a seminar course in which students will give an oral presentation of scientific data. Students attend seminars as well as prepare and present a seminar. The seminar is expected to enhance the student's public speaking skills and to provide experience in the preparation of visuals for scientific presentations. Critique of research objectives and approaches will be gained from audience questions.

Detailed Syllabus:

Seminar II Topics:

1) Distributed Ledger Technology
2) Hyperledger Project
3) Blockchain Security
4) Blockchain Architecture
5) Blockchain Applications
6) Web Analytics
7) Text Analytics and Sentiment Analysis
8) Predictive Analysis
9) Big Data Challenges
10) IoT and Big Data
11) Data Mining
12) Cloud Computing
13) Fog Computing
14) Advantages of Edge Computing
15) Grid Computing
16) Distributed Computing
17) Challenges of Edge Computing
18) Applications of Edge Computing
19) Autonomous Vehicle
20) Wireless Sensor Networks
21) Multi-access Edge Computing
22) Shingled Magnetic Recording
23) Magneto resistive Random Access Memory
24) Helium Drives
25) DNA Storage

Course Outcomes:
CO1: Analyze technically relevant current topics on computer science/information technology/research CO2: Utilize technical resources CO3: Create technical documents and give oral presentations related to the work completed CO4: Acquire the confidence in presenting the topic CO5:Create audience-centered presentations CO6: Create well-rehearsed and polished presentations meeting time, content, and interactive requirements.

Course Title	Mobile Computing Lab	**Course Code:** CSAM4011	
Teaching Scheme		**Evaluation Scheme**	
Lectures / Tutorial	**4 Hrs Week**	**Internal Assessment Test**	**15 Marks**
Total Credits	**2**	**End-Semester Examination**	**35 Marks**

Detailed Syllabus:

Name of Experiment

1 What is Mobile Computing? Explain the three tier architecture of mobile computing with diagram. 2 Write a WML program to create a card.

3 Write a WML program to create a deck that contains two cards and provide the Functionality of calling two cards from one another.

4 Write a WML program to display a list of following cards and provide the functionality to load a particular card, a. Sales b. Product c. Services

5 Write a WML program for usage of template tags.

6 Write a WML program to display the text in the following format. a) Bold b) Underlined c) Emphasized d) Big font e) Small font f) Strong font

7 Write a WML program to create the following table.

Honda	Suzuki	Yamaha
Mitsubis hi	Ford	Maruti

8 Write a WML program to implement the functionality of Login by username.

9 Write a WML program to display special characters on the screen.

10 Write a WML program to create the following selection list. a. Red b. Green c. Yellow d. Blue.

11 Write a WML program to create the following option group. 1. Honda 1.1 CD 100 1.2 CD Dawn 2. Suzuki 2.1 Max 100 2.2 Samurai.

12 Write a WML program to display the image on the screen after 5 seconds.

13 Write a WML program to develop the calculator.

Course Outcomes:

CO1: Understand the basic concepts of mobile computing.
CO2: Apply WML to create simple mobile web applications.
CO3: Analyze the functionality of different components in a WML application.
CO4: Evaluate the effectiveness of WML programs in achieving desired mobile application.
CO5: Create advanced WML programs to solve specific problems.