Curriculum and Syllabus

MASTER OF COMPUTER APPLICATION
(MCA, 2 years)

(With Effect from July 2020)

Department of Computer Application
Veer Surendra Sai University of Technology, Sambalpur
Burla-768018
Odisha

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA
DEPARTMENT OF COMPUTER APPLICATION

CURRICULUM FOR MASTER OF COMPUTER APPLICATION (MCA)

First Semester					
Sub Code	**Subject (Theory)**	**L**	**T**	**P**	**C**
MCA01001	Discrete Mathematics	3	0	0	3
MCA01002	Computer System Architecture	3	0	0	3
MCA01003	Data Structure Using 'C'	3	0	0	3
MCA01004	Operating System	3	0	0	3
MCA01005	Database Engineering	3	0	0	3
	Subject(Sessional)				
MCA01006	Data Structure Using C Lab	0	0	3	2
MCA01007	Operating System Lab	0	0	3	2
MCA01008	Database Engineering Lab	0	0	3	2
	Total				21

Second Semester					
Sub Code	**Subject (Theory)**	**L**	**T**	**P**	**C**
MCA02001	Computer Networks	3	0	0	3
MCA02002	Analysis and Design of Algorithms	3	0	0	3
MCA02003	Object Oriented Programming Using C++	3	0	0	3
MCA02004	Software Engineering	3	0	0	3
MCA02005	Formal Language and Automata Theory	3	0	0	3
	Subject(Sessional)				
MCA02006	Object Oriented Programming Using C++ Lab	0	0	3	2
MCA02007	Software Engineering Lab	0	0	3	2
MCA02008	Algorithm Design Lab	0	0	3	2
	Total				21

Third Semester					
Sub Code	**Subject (Theory)**	**L**	**T**	**P**	**C**
MCA03001	Programming with JAVA	3	0	0	3
MCA03002	Compiler Design	3	0	0	3
	NPTEL MOOC COURSE (min. 8 weeks)	0	0	0	3
	Elective I and II	3	0	0	3
	Elective I and II	3	0	0	3
	Subject(Sessional)				
MCA03003	JAVA programming Lab	0	0	3	2
	Seminar and Technical Writing	0	0	3	2
	Dissertation and Interim Evaluation	0	0	3	2
	Total				21

Fourth Semester					
Sub Code	**Subject (Theory)**	**L**	**T**	**P**	**C**
	Elective III and IV	3	0	0	3
	Elective III and IV	3	0	0	3
	Subject(Sessional)				
	Comprehensive Viva-Voice	0	0	0	1
	Dissertation Evaluation	0	0	4	6
	Total				13

Total Credit of four Semesters = 76

Elective I & II	
Subject Code	Subject Name
MCAPE301	Artificial Intelligence
MCAPE302	Soft Computing
MCAPE303	Computer Network security
MCAPE304	Information System Design
MCAPE305	Real-time System
MCAPE306	Mobile Computing
MCAPE307	Introduction to Data Science
MCAPE308	Machine Learning
MCAPE309	Internet-of-Things
MCAPE310	Big-Data Analytics
MCAPE311	Cyber Law and Security
MCAPE312	Intellectual Property Rights
MCAPE313	Web Technology
MCAPE314	Embedded System
MCAPE315	Management Information System

Elective III & IV	
Subject Code	Subject Name
MCAPE401	Digital Image Processing
MCAPE402	Data Mining
MCAPE403	Advanced Computer Networks
MCAPE404	Distributed Operating System
MCAPE405	Cloud Computing
MCAPE406	Simulation and Modelling
MCAPE407	Wireless Sensor Networks
MCAPE408	Software Project management
MCAPE409	Advance Database Management Systems
MCAPE410	Data Analytics
MCAPE411	Advanced Computer Architecture
MCAPE412	Intelligence Data Analysis
MCAPE413	Deep Learning
MCAPE414	E-Commerce and ERP
MCAPE415	Computer Graphics and Multimedia
MCAPE416	Computer Based Optimization techniques

No. of Value Added Courses: 7
Value Added Courses aim to provide learner centric technical training. The main objectives of the program are:

To provide students an understanding of the expectations of industry.
To improve employability skills of students.
To bridge the skill gaps and make students industry ready.
To provide an opportunity to students to develop inter-disciplinary skills.

Sl No.	Name of Course	Semester	Subject Code
1	Database Engineering	First Semester	MCA01005
2	Object Oriented Programming Using C++	Second Semester	MCA02003
3	Software Engineering	Second Semester	MCA02004
4	Machine Learning	Third Semester	MCAPE308
5	Web Technology	Third Semester	MCAPE313
6	Data Mining	Fourth Semester	MCAPE402
7	Cloud Computing	Fourth Semester	MCAPE405

With

NPTEL Certification Courses (MOOC Courses)
NPTEL (National Programme on Technology Enhanced Learning) is a joint initiative of the IITs and IISc. Through this initiative, online courses and certification in various topics are offered to the students and scholars to enrich their knowledge in various domains.

No of Employable Courses: 7

Sl No.	Name of Course	Semester	Subject Code
1	Data Structure Using ‘C’	First Semester	MCA01003
2	Operating System	First Semester	MCA01004
3	Database Engineering	First Semester	MCA01005
4	Analysis and Design of Algorithms	Second Semester	MCA02002
5	Object Oriented Programming Using C++	Second Semester	MCA02003
6	Software Engineering	Second Semester	MCA02004
7	Programming with JAVA	Third Semester	MCA03001
8	Software Project management	Fourth Semester	MCAPE408

No of Entrepreneurship related Courses: 5

Sl No.	Name of Course	Semester	Subject Code
1	Software Project management	Fourth Semester	MCAPE408
2	Internet-of-Things	Third Semester	MCAPE309
3	Intellectual Property Rights	Third Semester	MCAPE312
4	Data Analytics	Fourth Semester	MCAPE410
5	E-Commerce and ERP	Fourth Semester	MCAPE414

No of Skill development Courses: 5

Sl No.	Name of Course	Semester	Subject Code
1	Artificial Intelligence	Third Semester	MCAPE301
2	Mobile Computing	Third Semester	MCAPE306
3	Introduction to Data Science	Third Semester	MCAPE307
4	Machine Learning	Third Semester	MCAPE308
5	Internet-of-Things	Third Semester	MCAPE309

VISION OF THE DEPARTMENT

The Department of Computer Application has a multi-objective mission:

- To enable students acquire good academic and computational skills and devotion to scientific and technical knowledge.
- To inculcate the values of perseverance, sincerity and honesty.
- To empower them to become socially and economically responsible citizens of this country.

MISSION OF THE DEPARTMENT

The Department of Computer Application at Veer Surendra Sai University of Technology, Burla aims to inculcate value based, socially committed professionalism in the students to the cause of overall development of students and society using a compound metric comprising of:

M1. To provide qualitative education and generate new knowledge by engaging in cutting edge research projects and by offering state of the art postgraduate programmes, leading to careers as Computer Science professionals in the widely diversified domains of industry, government and academia.

M2. To promote a teaching and learning process that yields advancements in state of the art in computer science, resulting in integration of intellectual foundation and technical knowledge into other scientific disciplines leading to new technologies and products.

M3. To harness human capital for sustainable competitive edge and social relevance by inculcating the philosophy of continuous learning and innovation in Computer Science and application.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing postgraduates to achieve. The PEOs of the MCA Programme are described as below:

PEO-1	**Technical Knowledge** To bring the physical, analytical and computational approaches of Computer Science to bear on the challenges they take on, abstracting essential structure, recognizing sources of uncertainty, and applying appropriate models, technical tools, and evaluations to develop their solutions
PEO-2	**Leadership and Versatility** To bring to their careers the self-assurance, integrity, and technical strengths that drive innovation and the communication and collaboration skills to inspire and guide the groups they work with in bringing their ideas to fruition and to develop abilities and talents leading to creativity and productivity in fields and professions beyond the regular MCA curriculum.
PEO-3	**Diversification and Ethics** To promote among student postgraduates the ability to gain multidisciplinary knowledge through projects and industrial training, leading to a sustainable competitive edge in R&D and meeting societal needs and to sensitize students towards issues of social relevance, openness to other international cultures and to introduce them to professional ethics and practice.

Programme Articulation Matrix

PEO-MISSION Mapping	M1	M2	M3
PEO-1	**3**	**3**	**1**
PEO-2	**3**	**3**	**2**
PEO-3	**3**	**3**	**3**

PROGRAM OUTCOMES (POs)

POs describe what students are expected to know or be able to do by the time of post-graduation from the programme. The Program Outcomes of the MCA Programme are aligned with the graduate attributes and are described as below:

PO1	**Computational Knowledge:** Apply the knowledge of computing fundamentals, mathematics, and domain specific appropriate knowledge for computing specialization to the abstraction and conceptualization of computing models from well-defined problems and complex requirement specifications.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex computing problems in real life and reaching substantiated conclusions using fundamental principles of mathematics, computing, sciences, and relevant domain disciplines.
PO3	**Design/Development of Solutions with Societal and Environmental Concern:** Design and Evaluate solutions for complex computing problems to design and evaluate computing systems, components or processes that meet the specific needs in global or local context with appropriate consideration for the public health and safety, and the legal, cultural, societal, and environmental concerns.
PO4	**Conduct Investigations of Complex Computing Problems:** Use research-based knowledge and methodologies including design of solution models, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5	**Professional Ethics and Modern Tool Usage:** Understand and commit to professional ethics and cyber regulations, responsibilities, with norms of professional computing practices to create, select, and apply appropriate techniques, resources, and modern computing tools for performing complex computing activities, with an understanding of the limitations.
PO6	**Project management, Communication Efficacy, Life-Long Innovation and Entrepreneurship:** Demonstrate project knowledge and understanding of the computing in multidisciplinary environments, with effective communication among the team, computing community and society at large to function effectively as an individual, as a team member or a leader to engage in independent learning for continual development as a computing professional or entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On completion of the Master of Computer Applications degree, the graduates will be able to:

PSO-1: Design, develop and implement interdisciplinary application software projects for efficient design of computer-based systems of varying complexity in order to meet the demands of industry requirements using modern tools and technologies.

PSO-2: It is intended to provide Industry oriented education in applied computer science and to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer science.

FIRST SEMESTER

DISCRETE MATHEMATICS (MCA01001)

L	T	P	C
3	0	0	3

SYLLABUS:

Module-I (10 Periods)

Logic: Propositional equivalence, predicates and quantifiers, Methods of proofs, proof strategy, sequences and summation, mathematical induction, recursive definitions and structural induction, program correctness.

Counting: The basics of counting, the pigeonhole principle, permutations and combinations, recurrence relations, solving recurrence relations, generating functions, inclusion-exclusion principle, application of inclusion-exclusion.

Module-II (10 Periods)

Relations: Relations and their properties, n-array relations and their applications, representing relations, closure of relations, equivalence of relations, partial orderings.

Graph theory: Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, Euler and Hamilton paths, planar graphs, graph coloring, introduction to trees, application of trees.

Module-III (6 Periods)

Group theory: Groups, subgroups, generators and evaluation of powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, auto orphisms, homomorphism and normal subgroups, rings, integral domains and fields**.**

Module-IV (8 Periods)

Lattice theory: Lattices and algebras systems, principles of duality, basic properties of algebraic systems defined by lattices, distributive and complimented lattices, Boolean lattices and Boolean algebras, uniqueness of finite Boolean expressions, prepositional calculus.

Module-V (6 Periods)

Coding theory: Coding of binary information and error detection, decoding and error correction**.**

Text Books:

1. K.H. Rosen, "**Discrete Mathematics and its application**", 5th edition, Tata McGraw Hill Publication
2. C. L. Liu, "**Elements of Discrete Mathematics**", 2nd edition, Tata McGraw Hill Publication

Reference Books:

1. G. Shankar Rao, "**Discrete Mathematical Structure**", New Age Publisher
2. D. P. Acharjaya, Sreekumar "**Fundamental Approach to Discrete Mathematics**", New Age Publisher

COURSE OUTCOMES:

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

CO1	Define basic terminology, formal logic, Notation and its application.
CO2	Analyze the theory of inference and Predicate Calculus.
CO3	Specify and manipulate basic mathematical objects such as sets, functions and induction to recursion.
CO4	Construct the basic concepts of Algebraic Structures & Groups.
CO5	Define the basic concept graphs, trees and related algorithms.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	2	-	-	1

COMPUTER SYSTEM ARCHITECTURE (MCA01002)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module – I: **(8 Periods)**

Introduction: Review of basic computer architecture, Quantitative techniques in computer design, measuring and reporting performance**.**

Module – II: **(8 Periods)**

Pipelining: Basic concepts, Instruction and Arithmetic pipeline, Data hazards, Control hazards and Structural hazards, Techniques for handling hazards. Exception handling. Pipeline optimization techniques.

Module – III: **(8 Periods)**

Hierarchical memory technology: Inclusion, Coherence and locality properties, Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Mapping and Management techniques, Memory replacement policies**.**

Module – IV: **(8 Periods)**

Instruction-level Parallelism: Basic concepts, Techniques for increasing ILP, Superscalar, Superpipelined and VLIW Processor architectures. Array and Vector processors

Module – V: **(8 Periods)**

Multiprocessor architecture: Taxonomy of Parallel Architectures, Centralized shared-memory architecture, Synchronization, Memory consistency, Interconnection networks. Distributed shared memory architecture. Cluster computers

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2002.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.

REFRENCE BOOKS:

1. Patterson, "Computer Organisation and Design", Elsevier
2. John P Hayes, "Computer Organization", McGraw Hill
3. Mano," Computer System Architecture", PHI

COURSE OUTCOMES:

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

CO1	Explain the architecture and working principle of computer hardware components.
CO2	Define the concept and operation of pipelining and performance improvement.
CO3	Explain the hierarchical memory system including cache memories and virtual memory.
CO4	Outline the operation of Instruction level parallelism and analyze the different Parallel computer architectures and their performance.
CO5	Demonstrate the ways of communication between Interconnection Networks and issues of synchronization

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	2	1	2	3

DATA STRUCTURE USING C (MCA01003)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE – I **(10 Periods)**

Introduction: Basics of C programming: function, structure, pointer, Data Structure**,** Basic Terminology, Basic Data Structures and Operations, Algorithm Complexity and Time-Space Trade-off. **Stacks:** Representation and Implementation of Stacks, Operations on Stacks: Create, Push, Pop, Stack Overflow and Stack Underflow, Applications of Stacks: Infix to Postfix Conversion and Evaluation of Postfix Expression. **Queues:** Representation and Implementation of Queues, Operations on Queues: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues, Applications of Queues.

MODULE – II **(06 Periods)**

Linked list: Representation and Implementation of Singly Linked Lists, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Doubly Linked List, Polynomial Representation and Addition, Garbage Collection and Compaction.

MODULE – III **(06 Periods)**

Trees: Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Tree, Representation of Binary Trees, Binary Tree Traversals: Pre-Order, In-Order and Post-Order traversals, Binary Search Tree (BST), Insertion and Deletion in BST, Height Balanced Trees (AVL Trees).

MODULE – IV **(06 Periods)**

Graphs: Terminology and Representation**,** Directed Graphs, Sequential Representation of Graphs, Adjacency Matrix, Adjacency List, Graph Traversals: Breadth First Search (BFS) and Depth First Search (DFS), Spanning Trees, Topological Sorting`

MODULE – V **(12 Periods)**

Searching: Linear Search, Binary search **Sorting:** Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort **Hashing:** Hash Table, Hash Functions, Collision Resolution Techniques, Open and Closed Hashing, Hash Table Implementation

Text Books:

1**.** Reema Thareja, "**Data Structures Using C**", Oxford University Press

2. A.K.Rath and A.K.Jagadev, "**Data Structures and Program Design using C**", Scitech Publications.

Reference Books:

1. M. Tanenbaum, **"Data Structures using C & C++",** Prentice-Hall of India Pvt. Ltd.
2. Bruno R Preiss, **"Data Structures and Algorithms with Object Oriented Design Pattern in C++",** John Wiley & Sons, Inc**.**
3. Horowitz and Sahani, **"Fundamentals of data Structures**", Galgotia Publication Pvt. Ltd.

COURSE OUTCOMES:

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

CO1	Implement basic data structures such as arrays, linked lists, stacks, queues, graphs, trees and heaps.
CO2	Describe hashing, hash function, concepts of collision and its resolution methods.
CO3	Apply minimum cost spanning tree concept to solve a variety of problems.
CO4	Apply BFS and DFS graph traversals to solve different problems.
CO5	Apply algorithms for solving problems like sorting, searching, insertion, deletion and retrieval of data.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	1	-	2	3

OPERATING SYSTEM (MCA01004)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I (08 Periods)

Overview of Operating Systems: Introduction, how OS takes System Control, Why OS is essential, Functions of the Operating Systems, Evolution of Operating Systems, Generations of OS.

MODULE-II (08 Periods)

Operating System Structure & Processes: Introduction, System Components, Operating System Structure, Operating System Services, System Calls, System Programs, Process, Process States, Process Control.

MODULE-III (80 Periods)

Operating System Services for Process Management & Scheduling: Introduction, Process Creation, Termination & Other Issues, Threads, Multithreading, Types of Threads, Schedulers, Types of Schedulers, Types of Scheduling, Scheduling Algorithms, Types of Scheduling Algorithms.

MODULE-IV (08 Periods)

Process Synchronization, Interprocess Communication & Deadlock: Introduction, Data Access and Control Synchronization, Critical Sections, Race Condition, Classical Problems & Solutions of Process Synchronization, Semaphores, Message Passing, Deadlock, Conditions for Deadlock, Resource Allocation Graph, Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlocks.

MODULE-V (08 Periods)

Memory Management & Virtual Memory: Introduction, Memory Management Schemes, Sharing and Protection in Paging, Sharing and Protection in Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing

Text Books:

1. Silberschatz and Galvin, “Operating System Concepts”, John Wiley Publishing
2. Naresh Chauhan, “Principles of Operating Systems”, Oxford India Publications

Reference Books:

1. Pabitra Pal Choudhury, “Operating System Principles and Design”, PHI Publication
2. Sibsankar Halder and Alex A. Aravind, “Operating System”, Pearson Education
3. William Stallings, “Operating Systems Internals & Design Principles”, Pearson Education

COURSE OUTCOME:

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

CO1	Describe the role of operating system and explain the different structures of operating system.
CO2	Explain process management and compare the performance of various process scheduling algorithms.
CO3	Propose solutions for achieving process synchronization.
CO4	State the conditions that lead to deadlock and apply deadlock prevention, detection, avoidance algorithms.
CO5	Discuss different memory management techniques.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	3	2	2

DATABASE ENGINEERING (MCA01005)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module-I **(06 Periods)**

Introduction to DBMS: concept and overview of DBMS, data models, DB languages, DB users and Administrator, 3-schema architecture of DBMS, data independence, EF Codd Rule.

Module-II **(06 Periods)**

ER Model: basic concepts, design issues, keys, ER diagram, Weak entity sets, Extended ER features. **Relational model:** structure of relational model, Relational algebra, Extended relational algebra Operations.

Module – III **(08 Periods)**

Relational database design: FDs, Anamolies in designing DB, Normalization using FDs, various Normal forms-1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

Module – IV **(10 Periods)**

SQL and Integrity Constraints: Concepts of DDL, DML, DCL, various SQL operations: set operations, aggregate functions, constraints, view, nested sub queries, PL/SQL, cursor, trigger.

Module – V **(10 Periods)**

Internals of RDBMS: Query optimization, various optimization algorithms, Transaction processing, concurrency control and recovery management**. Advanced Database:** OODB, WEB based DB, Data warehousing and Data mining.

Text Books:

1) Er.Rajiv chopra, "**Database management systems, A Practical Approach**", S.Chand Publishing
2) Ramkrishna, "**Database management systems**", Tata McGraw Hill Publication

Reference Books:

1) Korth, Silverschatz, Abraham," **Database system concepts**", Tata McGraw Hill Publication
2) R.Elmasri, S.B Navathe, "**Fundamentals of Database System**", Adesion Wesley Publishing

COURSE OUTCOME:

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

CO1	Handle with different Data Base languages and various data models for Data Base.
CO2	Draw ER model and write queries mathematically and design data base.
CO3	Find anomalies and normalize data.
CO4	Write the queries using both sql and pl/sql.
CO5	Deal with online transactions, control Concurrency and understand types of Data Base failures and Recovery.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	2	3	1	1	2

DATA STRUCTURES USING C LABORATORY (MCA01006)

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS:

1. Implementation of Stack Using Array.
2. Implementation of Queue Using Array.
3. Implementation of Infix to Postfix Conversion using Stack.
4. Evaluation of Postfix Expression using Stack.
5. Implementation of Singly Linked List.
6. Implementation of Doubly Linked List.
7. Implementation of Stack Using Linked List.
8. Implementation of Queue Using Linked List.
9. Implementation of Binary Tree Traversal : Preorder, Inorder and Postorder.
10. Implementation of Binary Search Tree.
11. Implementation of sorting algorithms : Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Heap sort.
12. Implementation of Searching Algorithms : Linear Search and Binary Search
13. Implementation of Breadth First Search (BFS) in a Graph.
14. Implementation of Depth First Search (DFS) in a Graph.
15. Implementation of Hashing using hash functions.

COURSE OUTCOMES:

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

CO1	Organize the representation and use of primitive data types, built in data structure and allocation, use in memory.
CO2	Implement various basic data structures and its operations.
CO3	Apply and implement the learned algorithms for problem solving.
CO4	Identify the appropriate data structure to develop real time applications.
CO5	Implement various sorting and searching algorithms.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	3	-	2	2

OPERATING SYSTEMS LABORATORY (MCA01007)

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS:

1. Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.

a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority

2. Write a C program to simulate Multi-level Feedback Queue Scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – System processes and User processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.

3. Write a C program to simulate the MVT and MFT memory management techniques.

4. Write a C program to simulate the following Contiguous Memory allocation techniques a) Worst-fit b) Best-fit c) First-fit

5. Write a C program to simulate Paging technique of Memory management.

6. Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.

7. Write a C program to simulate Disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN

8. Write a C program to simulate Page replacement algorithms a) FIFO b) LRU c) LFU

9. Write a C program to simulate Page replacement algorithms a) Optimal

10. Write a C program to simulate Producer-Consumer problem using semaphores.

11. Write a C program to simulate the concept of Dining-Philosophers problem.

COURSE OUTCOME:

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

CO1	Implement basic services and Functionalities of the operating system using System Calls.
CO2	Describe the Benefits of Thread over Process and Implement synchronized programs using Multithreading Concepts.
CO3	Analyse and Simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
CO4	Implement Memory Management schemes and Page Replacement Schemes
CO5	Describe the Concepts of Deadlock in Operating Systems and Implement them in Multiprogramming System.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	1	1	2

DATABASE ENGINEERING LABORATORY (MCA01008)

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS:

1. Execute a single line and group functions for a table.
2. Execute DCL and TCL Commands.
3. Create and manipulate various DB objects for a table.
4. Create views, partitions and locks for a particular DB
5. Write PL/SQL procedure for an application using exception handling
6. Write PL/SQL procedure for an application using cursors.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write a PL/SQL block for transaction operations of a typical application using triggers.
9. Write a PL/SQL block for transaction operations of a typical application using package.
10. Design and develop an application using any front end and back end tool (make use of ER diagram and DFD).
11. Create table for various relation.
12. Implement the query in sql for a) insertion b) retrieval c) updating d) deletion.
13. Creating Views
14. Writing Assertion
15. Writing Triggers
16. Implementing operation on relation using PL/SQL
17. Creating Forms
18. Generating Reports

COURSE OUTCOME:

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

CO1	Apply different Database languages and can write queries mathematically.
CO2	Design data base and normalize data.
CO3	Define types of Data Base failures and Recovery and deal with online transactions and control Concurrency.
CO4	Write programs using both sql ans pl/sql.
CO5	Write triggers.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	2	3	2	1	2

SECOND SEMESTER

COMPUTER NETWORKS (MCA02001)

L T P C

3 0 0 3

SYLLABUS:

Module-I **(12 Periods)**

Overview of the Internet: introduction to data communication, computer networks, Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history, standards and administration; Comparison of the OSI and TCP/IP reference model. **Physical Layer:** data and signals: analog and digital, periodic analog signals, digital signals, transmission impairments, data rate limit, Guided transmission media, unguided transmission media.

Module– II **(08 Periods)**

Data Link Layer: error detection and correction design issues, CRC codes, Elementary Data Link Layer Protocols, sliding window protocols, noisy and noiseless channels.
Multiple Access Protocols: random access, controlled access, channelization**,** ALOHA, CSMA,

Module – III **(06 Periods)**

Connecting devices: learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways, definition of multiplexing and types.

Network Layer: Network Layer Design issues, store and forward packet switching, connection less and connection oriented networks-routing algorithms-optimality principle, circuit and packet switching, definition of flooding and multicast**.**

Module – IV **(05 Periods)**

Routing protocols: Shortest Path, Routing uni-cast Distance Vector Routing, RIP, link state protocols, path vector routing. **Internetworking:** logical addressing, internet protocols**,** IP address, CIDR, IPv4 addressing, IPv6 Protocol addressing, addresses mapping, ICMP, IGMP, ARP, RARP, DHCP.

Module -- V **(09 Periods)**

Transport Protocols: process to process delivery**,** UDP, TCP, TCP Service Model, TCP Sliding Window, TCP Congestion Control, congestion control and quality of service.
Application Layer- Introduction, providing services, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS.

Text Books:

1. Behrouz A. Forouzan, "**Data Communications and Networking**", McGraw Hill Publication
2. Andrew S Tanenbaum, "**Computer Networks**", Pearson Education

Reference Books:

1. L. L. Peterson and B. S. Davie, "**Computer Networks**", Elsevier.
2. James F. Kurose, K. W. Ross, "**Computer Networking: A Top-Down Approach Featuring the Internet**", Pearson Education.

COURSE OUTCOME:

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

CO1	Demonstrate communication and layered network architectures and to explain conventional computer system interfacing standards.
CO2	Design basic network systems using routing methods and analyze data communication technology.
CO3	Demonstrate the operation of a packet based sliding window protocol, Encryption and Decryption methods.
CO4	Demonstrate the operation of application layer using SMTP, TELNET, DNS, and FTP etc.
CO5	Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Articulation Matrix:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	-	3	3
CO2	3	3	3	-	3	2
CO3	3	3	3	-	3	2
CO4	3	3	3	-	3	3
CO5	3	3	3	-	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	3	-	3	3

ANALYSIS AND DESIGN OF ALGORITHMS (MCA02002)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I: (8 Periods)

Notion of Algorithm : Growth of functions, Recurrences: The Master method, The Substitution method, The Iteration method, Asymptotic Notations and Basic Efficiency Classes (Use of Big O, θ, etc.) in analysis of algorithms, Mathematical Analysis of few Non-Recursive and Recursive Algorithms.

MODULE-II: (8 Periods)

Sorting and Searching Techniques : Selection Sort, Bubble Sort, Insertion Sort, Sequential Search, Binary Search, Depth First Search and Breadth First Search, Balanced Search Trees, AVL Trees, Red-Black Trees, Heaps and Heap Sort, Disjoint Set and their Implementation, Divide and Conquer Paradigm of problem solving, Complexity analysis and understanding of Merge Sort, Quick Sort, Binary Search Trees.

MODULE-III: (8 Periods)

Greedy Techniques: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's and Bellman Ford Algorithm, Huffman Trees, Knapsack problem.

Dynamic Programming Paradigm : Floyd-Warshall Algorithm, Optimal Binary Search trees, Matrix Chain Multiplication Problem, Longest Common Subsequence Problem, 0/1 Knapsack Problem, Maximum Network Flow Problem.

MODULE-IV: (8 Periods)

String Matching Algorithms: Naive string matching algorithm, The Rabin-Karp Algorithm, string matching with Finite Automata, Knuth Morris Pratt string matching algorithm.

Backtracking: n-Queen's problem, Hamiltonian Circuit problem, Subset-Sum problem, State Space Search Tree for these problems

MODULE-V: (8 Periods)

Branch and Bound: Travelling Salesman Problem and its State Space Search Tree.

Introduction to Computability: Polynomial-time verification, NP-Completeness and Reducibility, NP-Complete problems.

Approximation Algorithms: Vertex Cover Problem.

Text Books:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "**Introduction to Algorithms**", PHI Publication

Reference Books:

1. A.V. Aho, J. E. Hopcroft and J.D.Ullman, "**The Design and Analysis of Computer Algorithms**", Pearson Education,
2. R. S. Salaria, Khanna, "**Data Structure & Algorithms**", Khanna Book Publishing Co. (P) Ltd.

COURSE OUTCOME:

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

CO1	Describe different types of asymptotic notations that are used to analyze the running time of different algorithms and solve recurrences.
CO2	Analyse and derive the running time for different searching and sorting algorithms, study about AVL trees and their construction, Red-Black trees, Overview of Divide and Conquer paradigm with examples.
CO3	Solve a variety of problems using different algorithm design paradigms like Dynamic Programming, Greedy Method, construction of Minimum Spanning Tree, study of Shortest Path problem and Maximum Network Flow problem.
CO4	Demonstrate different String Matching algorithms, Backtracking method, example problems and their backtracking solution using State Space Search Tree method.
CO5	Demonstrate of Branch and Bound technique, example problems and their solution using State Space Search Tree method, study of P, NP and NP-Complete problems, Approximation algorithms and example problems.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	1	2	3

OBJECT ORIENTED PROGRAMMING USING C++ (MCA02003)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I: (8 Periods)

Introduction to Object Oriented Programming: user defined types, polymorphism, and encapsulation. Getting started with C++ - syntax, data-type, variables, strings, functions, exceptions and statements, namespaces and exceptions operators. Flow control, functions, recursion. Arrays and pointers, structures.

MODULE-II: (8 Periods)

Abstraction Mechanisms: Classes, private, public, constructors, destructors, member functions, static members, references etc. class hierarchy, derived classes.

MODULE-III: (8 Periods)

Prototypes: linkages, operator overloading, ambiguity, friends, member operators, operator function, I/O operators etc. **Inheritance:** simple inheritance, polymorphism, object slicing, base initialization, virtual functions.

MODULE-IV: (8 Periods)

Memory management: new, delete, object copying, copy constructors, assignment operator, this Input/output. **Exception handling:** Exceptions and derived classes function exception declarations, unexpected exceptions, Exceptions when handling exceptions, resource capture and release etc.

MODULE-V: (8 Periods)

Templates and Standard Template library: template classes declaration, template functions, namespaces, string, iterators, hashes, iostreams and other type. **Design using C++ design and development:** design and programming, role of classes.

Text Books:

1. Herbert Schildt, "**C++. The Complete Reference**", Tata McGraw Hill Publications
2. E. Balaguruswamy, "**Object Oriented Programming with C++**", Tata McGraw Hill Publications.
3. A.K.Kamthane, "**Object Oriented Programming with ANSI & Turbo C++**.", Pearson Education.

Reference Books:

1. R. Venugopal, Rajkumar, and T. Ravishanker "**Mastering C++**", Tata McGraw Hill Publications
2. Bjarne Stroustrup , "**The C++ Programming Language**", Addison Welsley.

COURSE OUTCOME:

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

CO1	Get a brief overview of Object Oriented Programming concepts.
CO2	Solve the problems in a systematic way using class and method paradigms.
CO3	Implement different types of inheritance efficiently and also study friend functions, operator overloading and virtual functions.
CO4	Describe the concepts of dynamic memory management using new and delete operators and study about the exception handling mechanism.
CO5	Demonstrate template functions and Standard Template Library (STL), Object-Oriented Design and Programming using C++.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	1	1	3

SOFTWARE ENGINEERING (MCA02004)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module-I **(9 Periods)**

Introduction: Introduction to Software Engineering, evolving role of software, defining software engineering, changing nature of software, software myths, terminologies, role of software development, Software Processes & Characteristics, software life cycle models – build & fix model, Waterfall, Prototype, Evolutionary and Spiral Models, Software Crisis and solutions, **Software Requirements analysis & specifications:** Requirements analysis using DFD, Data dictionaries, Requirements documentation, Nature of SRS, Characteristics & organization of SRS

Module-II **(9 Periods)**

Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation, Models-COCOMO, Putnam resource allocation model, Validating Software Estimates, Software Risk Management. **Software Metrics and Measurements:** software and metrics, What & Why, Token Count, Halstead Software Science Measures, and Data

structure metrics, information flow metrics.

Module-III **(5 periods)**

Software design: overview of design, characteristics, design activities and methodologies, characteristics, design techniques, cohesion and coupling, basics of object oriented and function oriented design and differences.

Module-IV **(8 periods)**

Coding and Software Testing: coding standards, code review, code walk through, code inspection, software documentation, Testing process, Design of test cases, Introduction to functional testing & Structural testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing.

Module-V **(9 periods)**

Software Reliability: importance, hardware reliability and software reliability, failure and faults, reliability models-basic model, software quality model, CMM and ISO 9001

Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

Text Books:

1. K. K. Aggarwal and Yogesh Singh, "**Software Engineering**", New Age International Publishing
2. R. S. Pressman, "**Software Engineering – A Practitioner's Approach**", McGraw Hill Int. Publication
3. Pankaj Jalote, "**An Integrated Approach to Software Engineering**", Narosa Publication

Reference Books:

1. Stephen R. Schach, "**Classical & Object Oriented Software Engineering**", IRWIN Publication
2. James Peter, W. Pedrycz, "**Software Engineering: An Engineering Approach**", John Wiley & Sons.
3. Sommerville, "**Software Engineering**", Addison Wesley Publishing
4. Rajib Mall, "**Fundamrntal of Software Engineering**", PHI Publication.

COURSE OUTCOME:

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

CO1	Define the concepts of software and engineering discipline in software development, process models and apply science, and engineering.
CO2	Identify, formulate, and solve engineering problems, project planning and understanding characteristics of good software design.
CO3	Evaluate the software quality models and use the techniques, skills, and modern engineering tools necessary for engineering practice.
CO4	Analyse, design, verify, validate and maintain software systems and the ability to work in one or more significant application domains.
CO5	Define the concepts re-engineering, reuse and maintenance of software product and able to develop SRS document and project.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	2	3	3	2

FORMAL LANGUAGE AND AUTOMATA THEORY (MCA02005)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I **(10 Periods)**

Automata and Language Theory: Overview of Theoretical Computer Science (including computationally intractable problems) , Introduction to System software including various phases / Modules in the design of a typical compiler , Chomsky Classification, Finite Automata, Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA),statement of Kleen's Theorem, Regular Expressions, Equivalence of DFAs, NFAs.

Module – II **(6 Periods)**

Regular Expressions, Closure properties of Regular Language, Non-Regular Languages, Pumping Lemma, Use of Regular expressions in the Design of scanner (lexical analyzer).

Module – III **(8 Periods)**

Context Free Languages: Context Free Grammar (CFG), Parse Trees, Push Down Automata (deterministic and nondeterministic) (PDA), Equivalence of CFGs and PDAs, Closure properties of CFLs, Pumping Lemma.

Module – IV **(8 Periods)**

Turing Machines and Computability Theory: Definition of Turing Machine, Extensions of Turing machines, Non – deterministic Turing machines, Church – Turing Thesis, Decidability, Halting Problem.

Module – V **(10 Periods)**

Complexity Theory: Complexity classes P, NP, Decidability, Recursively enumerable language, Post correspondence problem.

Text Books:

1. M. Sipser, "**Introduction to the Theory of Computation**", Cengage Publication

2. J. Hopcroft, R. Motwani, and J. Ullman, "**Introduction to Automata Theory, Language and Computation**", Pearson Publication

3. H.S. Behera, J. Nayak, H. Pattanayak, "**Formal Languages and Automata Theory" Vikas Publication.**

Reference Books:

1. K. L. Mishra and N. Chandrasekharan, "**Theory of Computer Science Automata Language Computation**", PHI Publication

2. Peter Linz, "**Introduction to Formal Languages and Automata**", Narosa Publication.

COURSE OUTCOME:

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

CO1	Express the overview of the theoretical foundation of computer science from the perspective of formal languages.
CO2	Demonstrate regular language and expression in the context of computation and compiler. Define and design the deterministic and nondeterministic machines.
CO3	Demonstrate and design push down automata and context free language. .
CO4	Define the concept of Turing machine and able to design Turing machine for various languages.
CO5	Analyze the complexity classes, decidability, enumerable language, post correspondence problem and associated concepts.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	2	1	-	3	2

OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY (MCA02006)

L	T	P	C
0	0	3	2

LIST OF PROGRAMS:

1. Programs on concept of functions.
2. Programs on function overloading and handling ambiguities.
3. Programs on function calls (call by value, call by address and call by reference).
4. Programs on concept of classes and objects.
5. Programs on friend functions and friend classes.
6. Programs to perform operations using constructors and destructors.
7. Programs on different types of inheritance.
8. Programs on delegation.
9. Programs on static and dynamic polymorphism, use of virtual functions.
10. Programs to perform operator overloading for unary, binary and I/O operators.
11. Programs to perform dynamic memory management, use of new and delete operators.
12. Programs on handling of String classes.
13. Programs on generic programming using template functions and template classes.
14. Programs on exception handling.
15. Programs on file handling.

COURSE OUTCOME:

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

CO1	Map real world problems into the programming language using classes and objects.
CO2	Solve the problems in a systematic way using class and method paradigms.
CO3	Implement different types of Inheritance efficiently.
CO4	Implement the concepts of Function Overloading, Operator Overloading and Virtual Functions.
CO5	Master Exception Handling and File Handling techniques.

Course Articulation Matrix:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	-	-	3
CO2	3	3	3	-	-	3
CO3	3	3	3	-	-	3
CO4	3	3	3	-	-	3
CO5	3	3	3	-	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	-	-	3

SOFTWARE ENGINEERING LABORATORY (MCA02007)

L	T	P	C
0	0	3	2

Software Requirement

Rational Rose, Argo-UML, Windows XP

LIST OF EXPERIMENT

1. To Note down the problem statement for a given system of relevance.

2. To perform requirement analysis and generate Software Requirement Specification (SRS) document for suggested system.

3. To develop the function-oriented diagram: Data Flow Diagram (DFD) and Structured chart of given problem statement.

4. To draw the ER- diagram for given application software.

5. To perform the user‘s view analysis for the suggested system: Use case diagram.

6. To draw the structural view diagram for the system: Class diagram, object diagram.

7. To draw the behavioural view diagram: State-chart diagram, Activity diagram

8. To perform the behavioural view diagram for the suggested system: Sequence diagram, Collaboration diagram

9. To perform the implementation view diagram: Component diagram for the system.

10. To perform the environmental view diagram: Deployment diagram for the system.

11. To perform various testing operations using the testing tool unit testing, integration testing for a suggested system.

12. Draw PERT Chart and GANT chart for selected software project.

13. Perform effort estimation using FP Estimation for chosen system

List of projects on different problem statement

a. Student Result Management System
b. Library management system
c. Inventory control system
d. Accounting system
e. Fast food billing system
f. Bank loan system

g. Blood bank system
h. Railway reservation system
i. Automatic teller machine
j. Video library management system
k. Hotel management system
l. Online Student Registration System
m. E-ticking
n. Share online trading
o. Online Examination System
p. Resource management system
q. Court case management system

COURSE OUTCOMES:

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

CO1	Implement the various open source tools could be applied in different specific domain.
CO2	Use the software tools and methodology to develop the software product.
CO3	Make the software requirement specification document of the any given problem statement.
CO4	Draw and develop the UML diagram based on different vies i.e users view, behavioural view, implementation view etc.
CO5	Perform the time line for the PERT chart and GANT chart for the given software project metrics.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	2	3	3	2

ALGORITHM DESIGN LABORATORY (MCA02008)

L	T	P	C
0	0	3	2

LIST OF PROGRAMS:

1. Implementation of Stack and Queue – Operations and Applications.
2. Implementation of different searching algorithms.
3. Implementation of different sorting algorithms.
4. Problem solving using Divide and Conquer technique.
5. Problem solving using Dynamic Programming technique.
6. Problem solving using Greedy technique.
7. Problem solving using Backtracking technique.
8. Problem solving using disjoint-set data structure operations.
9. Problem solving using Branch and Bound technique.
10. Problem solving for the Maximum Flow problem.
11. Implementation of Graph Traversal algorithms – Breadth-First-Search (BFS) and Depth-First-Search (DFS).
12. Implementation of Minimum Spanning Tree construction algorithms – Kruskal and Prim.
13. Implementation of different String Matching algorithms.
14. Problem solving for the Shortest Path problem using different algorithms.
15. Problem solving using Approximation algorithms.

COURSE OUTCOME:

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

CO1	Analyze and implement different searching and sorting algorithms.
CO2	Solve a variety of problems using different algorithm design paradigms like Divide and Conquer, Dynamic Programming, Greedy Method, Backtracking and Branch and Bound.
CO3	Solve the minimum cost spanning tree problem using Kruskal and Prim algorithms.
CO4	Solve the Shortest Path and Maximum Flow problem using different algorithms.
CO5	Solve the String Matching problem using different algorithms.

Course Articulation Matrix:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	-	-	3
CO2	3	3	3	-	-	3
CO3	3	3	2	-	-	3
CO4	3	3	3	-	-	3
CO5	3	3	3	-	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	-	-	3

THIRD SEMESTER

PROGRAMMING WITH JAVA (MCA03001)

L	T	P	C
3	0	0	3

SYLLABUS:

Module- I **(10 periods)**

Introduction: History of java, C++ Vs JAVA, JAVA and Internet and WWW, JAVA support systems, JAVA environment. JAVAprogram structure, Tokens, Statements, JAVA virtual machine, Constant & Variables, Data Types, Declaration of Variables, Scope of Variables, Symbolic Constants, Type Casting.
Operators: Arithmetic, Relational, Logical Assignments, Increment and Decrement, Conditional, Bitwise, Special, Expressions & its evaluation. If statement, if…else… statement, Nesting of if…else… statements, else…if Ladder, Switch, conditional operators, Loops – While, Do, For, Jump in Loops, Labelled Loops.

Module- II **(10 Periods)**

Classes & Methods: Defining a Class, Adding Variables and Methods, java class attributes, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, this pointer. **Inheritance:** Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control, super key word, java inner class.

Module -III **(10 Periods)**

Arrays: Arrays: One Dimensional & two Dimensional, String classes, Math class and methods, Vectors, wrapper Classes,
Package: creating package, System Packages, Using System Package, Adding a Class to a Package, Hiding Classes. **Threads:** Creating Threads, Extending the Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable Interface, Daemon thread, deadlock situation.

Module –IV **(05 Periods)**

Interface: DefiningInterface, Extending Interface, Implementing Interface, Accessing Interface Variable, interface versus abstract class, **Exception Handling:** Definition of an Exception, error versus exception, Exception Classes, Common Exceptions, Exception Handling Techniques, java file handling.

Module –V **(05 Periods)**

Local and Remote Applets Vs Applications : Writing Applets, Applets Life Cycle, Creating an Executable AppletDesigning a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, Passing Parameters to Applets, Aligning the Display, HTML Tags & Applets, Getting Input from the User.

Text Books:

1. E. Balaguruswamy,**"Programming In Java",** TMH Publications

Reference Books:

2. Peter Norton,**"Peter Norton Guide To Java Programming",** Techmedia Publications

COURSE OUTCOME:

After completion the course students are able to:

CO1	Demonstrate the use of OOPs concepts and solve real world problems using OOP techniques.
CO2	Implement the use of abstraction.
CO3	Demonstrate the use of Packages and Interface in java.
CO4	Develop and implement exception handling, multithreaded applications with synchronization.
CO5	Design GUI based applications and develops applets for web applications.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	-	2	3

COMPILER DESIGN (MCA03002)

L	T	P	C
3	0	0	3

SYLLABUS:

Module- I: (08 Periods)

Compiler Structure: Model of compilation, various phases of a compiler. Lexical analysis: Interface with input parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, input buffering. Specification of tokens. Regular grammar & language definition.

Module- II: (12 Periods)

Syntax Analysis: Grammar, Parsing, ambiguity, top down parsing, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing LL(1) grammar, Nor LL(1) grammar, Bottom up parsing, operator precedence grammars, LR parsers (SLR, CLR, LALR).

Module- III: (10 Periods)

Syntax directed definitions: Inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions. Type checking: type: type system, type expressions, structural and name equivalence of types, type conversion. **Run time system**: storage organization, activation tree, activation record, parameter passing symbol table, dynamic storage allocation.

Module- IV: (10 Periods)

Intermediate code generation: intermediate code representation techniques. Intermediate Code generation for control flow, function call, Boolean expressions and procedure calls. **Code optimization:** source of optimizations, optimization of basic blocks, loops, global dataflow analysis, solution to iterative dataflow equations, code improving transformations, dealing with aliases, data flow analysis of structured flow graphs.

Module- V: (10 Periods)

Code generation and instruction selection: Issues, basic blocks and flow graphs, register allocation, code generation, DAG representation of programs, code generation from DAGS, peep hole optimization. **Symbol table management**: Data structure for symbol table organization. Error Handling and recovery.

Text Books:

1. K. C. Louden, "**Compiler Construction, Principle and Practice**", Cengage Publication
2. Alfred V. Aho, Ravi Sethi, and Ullman, "**Compilers Priciples, Techniques and Tools**", Pearson Publication

Reference Books:

1. V.Raghvan, "**Principles of Compiler Design**", TMH Publication

2. Levine, Mason and Brown, "**Lex & Yacc**", O' Reilly Publication

COURSE OUTCOME:

On successful completion of the course students will be able to:

CO1	Specify and analyze the lexical, syntactic and semantic structures of advanced language features.
CO2	Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
CO3	Design a parser, and semantic analyser without the aid of automatic generators.
CO4	Implement code optimization and instruction selection practices.
CO5	Describe techniques for intermediate code and machine code optimization.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	1	2	3

NPTEL MOOC COURSE (min. 08 weeks)

L	**T**	**P**	**C**
0	**0**	**0**	**3**

Student shall submit certificates showing the credit points (no. of week course) earned through **SWAYAM** MOOCs to the Head of the department.

PROGRAMMING WITH JAVA LABORATORY (MCA03003)

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS:

1. Write a Java Program to define a class, describe its constructor, overload the Constructors and instantiate its object.
2. Write a Java Program to define a class, define instance methods for setting and retrieving values of instance variables and instantiate its object.
3. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation.
4. Write a Java Program to demonstrate use of sub class.
5. Write a Java Program to demonstrate use of nested class.
6. Write a Java Program to implement array of objects.
7. Write a Java program to practice using String class and its methods.
8. Write a Java program to practice using String Buffer class and its methods.
9. Write a Java Program to implement Vector class and its methods.
10. Write a Java Program to implement Wrapper classes and their methods.
11. Write a Java Program to implement inheritance and demonstrate use of method overriding.
12. Write a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods.
13. Write a program to demonstrate use of implementing interfaces.
14. Write a program to demonstrate use of extending interfaces.
15. Write a Java program to implement the concept of importing classes from user defined package and creating packages.
16. Write a program to implement the concept of threading by extending Thread Class.
17. Write a program to implement the concept of threading by implementing Runnable Interface.
18. Write a program to implement the concept of Exception Handling using predefined exception.
19. Write a program to implement the concept of Exception Handling by creating user defined exceptions.
20. Write a program using Applet to display a message in the Applet.
21. Write a program using Applet for configuring Applets by passing parameters.
22. Write a Java Program to demonstrate animation driven program using applet and html.

COURSE OUTCOME:

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

CO1	Be familiar with the main features and limitations of the Java programming language to develop source code.
CO2	Applied the principles of OOPs concepts to be applied in development of software product.
CO3	Be familiar with common errors and exceptions in Java and its associated libraries to debug and test.
CO4	Demonstrate multi-threading programming skills used in various real time system projects.
CO5	Develop the event driven programs and animations of objects using applet program and mark-up language.

Course Articulation Matrix:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	-	2	3
CO2	3	3	3	-	2	2
CO3	3	3	3	-	3	3
CO4	3	3	3	-	3	3
CO5	3	3	3	-	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	-	3	3

SEMINAR AND TECHNICAL WRITING

L	**T**	**P**	**C**
0	**0**	**3**	**2**

There shall be a seminar in MCA course. For seminar the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding on the topic, and submit it to the department. Further, student has to give a presentation on the seminar report before departmental committee. After successful presentation of seminar each student have to submit a technical report in the department.

The marks for seminar are awarded as follows:

1) Day to day work - 20 Marks
2) Report preparation - 20 Marks
3) Seminar Presentation - 40 Marks
4) Viva-Voce on the Seminar topic - 20 Marks

Total - 100 Marks

DISSERTATION AND INTERIM EVALUATION

L	T	P	C
0	0	3	2

There shall be an MCA dissertation and interim evaluation in the 3rd semester. The student need to prepare a synopsis report and present before the Departmental committee consisting of three senior faculty members and supervisor.

The award of Marks for the dissertation and interim evaluation

1) Day to day work (awarded by the Supervisor) - 50 Marks

2) Report (Awarded by the Committee) - 20 Marks

3) Presentation Seminar (Awarded by the Committee) - 20 Marks

4) Viva Voce (Awarded by the Committee) - 10 Marks

Total= 100 Marks

FOURTH SEMESTER

COMPREHENSIVE VIVA-VOCE

L	T	P	C
0	0	0	1

There shall be a Comprehensive Viva-Voce at the end of 4th semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and three Senior Faculty members of the Department covering different specializations and two External Examiners from academic institutes. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he studied during the MCA course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voice.

DISSERTATION EVALUATION

L	T	P	C
0	0	4	6

There shall be an MCA dissertation in the 4th semester. The student shall investigate or work on a topic in any subject related to the course. During the dissertation work student shall do experimental or review work or any other type of project approved by the Departmental committee consisting of three senior faculty members of different specialization and HOD. The committee should adopt a rational approach in assigning project supervisor to a student in 3rd semester with respect to the research interest of the students in different specializations. When a student chooses to do project work in an industries/reputed institutions/universities then the internal faculty member should be the one of the supervisor for completion of the dissertation. Attendance of such students doing project shall be furnished by the internal supervisor based on his interaction with the student. At the end of the 4th Semester the student shall submit a project report and give a power point presentation before the Departmental committee with external Examiner(s) outside the University in the relevant fields.

The award of Marks for the dissertation

1) Day to day work (awarded by the Supervisor) - 50 Marks
2) Dissertation (Awarded by the Committee) - 10 Marks
3) Presentation of dissertation Seminar (Awarded by the Committee) - 20 Marks
4) Viva Voce (Awarded by the Committee) - 20 Marks

Total= 100 Marks

ELECTIVE- I & II

ARTIFICIAL INTELLIGENCE (MCAPE301)

L	T	P	C
3	0	0	3

SYLLABUS:

Module –I **(8 Periods)**

Introduction to Artificial Intelligence: The Foundations of Artificial Intelligence, The History of Artificial Intelligence, and the State of the Art. Solving Problems by Searching: problem-solving Agents, Formulating problems, Example problems, and searching for Solutions, Search Strategies, Avoiding Repeated States, and Constraint Satisfaction Search. Informed Search Methods: Best-First Search, Heuristic Functions, Memory Bounded Search, and Iterative Improvement Algorithms.

Module –II **(8 Periods)**

Intelligent Agents: Introduction, How Agents should Act, Structure of Intelligent Agents, Environments. Agents That Reason Logically; A Knowledge-Based Agent, The Wumpus World Environment, Representation, Reasoning & Logic prepositional Logic : A very simple Logic, An agent for the Wumpus World. Building a Knowledge Base; Properties of Good and Bad Knowledge Bases, Knowledge Engineering. Inference in First-Order Logic: Inference Rules Involving Quantifiers, An Example Proof. Generalized Modus Ponens, Forward and Backward, Chaining, Resolution.

Module –III **(8 Periods)**

Planning A Simple Planning Agent Form Problem Solving to Planning. Planning in Situation Calculus. Basic Representations for Planning. A Partial-Order planning Example, A partial Order planning algorithm, Planning With partially Instantiated Operators.

Module –IV **(8 Periods)**

Learning in Artificial Neural Networks. How the Brain Works, Neural Networks, perceptions, Multi-layered Feed Forward Networks Applications Back propagation algorithm Applications of Neural Networks.

Module –V **(8 Periods)**

Knowledge Representation: Semantic Net, Semantic Web, Conceptual Dependencies, Conceptual Graphs, Script, Frames. Natural language processing, A Formal Grammar for A subset of English Syntactic Analysis (Parsing), Definite Clause Grammar (DCG), Augmenting A Grammar. Semantic Interpretation. Ambiguity and unambiguous.

Text Books:

1. Russell S.J. & Norvig P, Artificial Intelligence – A modern Approach (ISBN 0-131-038-052) Prentice Hall Inc, 2002.
2. Winston P.H, Artificial Intelligence (3rd Edigion), McGraw Hill.
3. E.Rich and K.Knight, Artificial Intelligence, - TMH

Reference Book:

1. Padhy N.P., Artificial Intelligence and Intelligence Systems, Oxford

COURSE OUTCOME:

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

CO1	Assess critically the techniques presented and to apply them to real world problems. Get an introductory concepts and problem solving techniques in Artificial Intelligence.
CO2	Define the major concepts of Intelligent agents, Reasoning & Logic prepositional Logic.
CO3	Demonstrate concept of planning in Artificial intelligence.
CO4	Analyze the Learning in Artificial Neural Networks and various neural network models.
CO5	Aware of knowledge representation and Natural language processing in Artificial intelligence.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	2	3	3

SOFT COMPUTING (MCAPE302)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE- I **(10 Periods)**

Introduction to Soft Computing: Evolution of Computing - Soft Computing Constituents – From Conventional to Computational Intelligence - Machine Learning Basics

MODULE- II **(10 Periods)**

Genetic Algorithms: Introduction, Building block hypothesis, working principle, Basic operators and Terminologies like individual, gene, encoding, fitness function and reproduction, Genetic modelling: Significance of Genetic operators, Inheritance operator, crossover, inversion & deletion, mutation operator, Bitwise operator, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (Travelling Salesman Problem),Differences & similarities between GA & other traditional methods, Applications of GA.

MODULE- III **(10 Periods)**

Neural Networks: Machine Learning using Neural Network, Adaptive Networks, Feed Forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks, Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance Architectures, Advances in Neural Networks.

MODULE- IV **(6 Periods)**

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

MODULE- V **(4 Periods)**

Neuro-Fuzzy Modelling: Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modelling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification, Neuro-Fuzzy Control – Case Studies

Text Books:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "**Neuro-Fuzzy and Soft Computing**", PHI India
2. Kwang H.Lee, "**First course on Fuzzy Theory and Applications**", Springer–Verlag Berlin Heidelberg

Reference Books:

1. S.N.Sivanandam, S.N.Deepa, "**Introduction To Genetic Algorithms**", Springer
2. Eiben, Smith, "**Introduction To Evolutionary Computing**", Springer

COURSE OUTCOME:

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

CO1	Analyze various Soft Computing basic and evolution of computing.
CO2	Implement Genetic algorithm and optimisation techniques.
CO3	Define Neural Network techniques and its applications.
CO4	Demonstrate fuzzy logic and its applications
CO5	Get the knowledge of Applications of Hybrid soft computing techniques.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	2	3	3

COMPUTER NETWORK SECURITY (MCAPE303)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module-I **(10 Periods)**

Introduction: Services, Mechanisms and attacks, the OSI security Architecture, Network security model, Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).

Finite Fields And Number Theory : Groups, Rings, Fields Modular arithmetic, Euclid's algorithm, Finite fields, Polynomial Arithmetic, Prime numbers, Fermat's and Euler's theorem, The Chinese remainder theorem- Discrete logarithms.

Module - II **(10 Periods)**

Block Ciphers: Data Encryption Standard, Block cipher principles, block cipher modes of operation, Advanced Encryption Standard (AES)

Public key cryptography: Principles of public key cryptosystems, The RSA algorithm, Key management, Hash Function and Digital Signatures: Authentication requirement, Authentication function, MAC, Hash function, Security of hash function and MAC, MD5, SHA, HMAC, CMAC, Digital signature and authentication Protocols.

Module - III **(06 Periods)**

Security Practice and System Security: Authentication applications, Kerberos, Internet Firewalls, Roles of Firewalls, Firewall related terminology, Firewall designs, Intruder, Intrusion detection system, Virus and related threats, Countermeasures, Firewalls design principles.

Module - IV **(06 Periods)**

E-mail Security: Security Services for Email attacks, establishing keys privacy, authentication of the source, Message Integrity

Module - V **(08 Periods)**

IP Security: Overview of IPSec, IP and IPv6, Authentication Header, Encapsulation Security Payload (ESP) Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding).

Web Security: SSL/TLS Basic Protocol, computing the keys- client authentication, PKI as deployed by SSL Attacks fixed in v3, Exportability, Encoding, Secure Electronic Transaction (SET).

Text Books:

1. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", Pearson Publishing

2. William Stallings, "Crpyptography and Network security - Principles and Practices", Pearson Publishing.

Reference Books:

1. W. Mao, **"Modern Cryptography – Theory and Practice"**, Pearson Education.

2. Charles P. Pfleeger, Shari Lawrence Pfleeger **"Security in computing"** Prentice Hall of India.

COURSE OUTCOME:

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

CO1	Analyze different types of Security attacks. Symmetrical and Asymmetrical cryptography .To discuss on various types of attacks and their characteristics.
CO2	Illustrate the basic concept of encryption and decryption for secure data transmission. Students will be able to analyse and compare different security mechanisms and services and Digital signature and authentication Protocols.
CO3	Analyze different modern encryption algorithms. Students will have the basic knowledge of different authentication Mechanisms and Security Practice and System Security.
CO4	Describe network security services and mechanisms. Security Services for Email attacks, establishing keys privacy, authentication of the source, Message Integrity.
CO5	Implement various network security applications, IPSec, Firewall, IDS, Web security, Email security, and malicious software etc.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	2	2	-	1

INFORMATION SYSTEM DESIGN (MCAPE304)

L	T	P	C
3	0	0	3

SYLLABUS:

Module – I: (08 Periods)

Introduction to Information System Development: Information System Development, System Analyst, System Analysis & Design, Categories of Information System, System Development Strategies Implementation, Evaluation and Maintenance.

Module – II: (08 Periods)

Approaches to System development: SDLC, Explanation of the phases, Different models their advantages and disadvantages, Waterfall approach, Iterative approach, Extreme

programming RAD model, Unified process, Evolutionary software process model, Incremental model, Spiral model, Concurrent development model development.

Module – III: (08 Periods)

Investigating System Requirements & Feasibility Analysis: Activities of the analysis phase, Fact finding methods, Review existing reports, forms and procedure descriptions, Conduct interviews, Observe and document business processes, Build prototypes, Questionnaires, Conduct jad sessions, Validate the requirements, Structured walkthroughs, Feasibility Study and Cost Estimates, Cost benefit analysis, Identification of list of deliverables.

Module – IV: (08 periods)

Modelling System Requirements & Design: Data flow diagram logical and physical, Decision tables, Decision trees, Entity relationship diagram, Data dictionary, Design phase activities, Develop System Flowchart, Structure Chart, Software design and documentation tools, Designing databases

Module – V: (08 Periods)

Designing input, output and user interface with Testing: Input design, Output design, User interface design, Strategic approach to software testing, Test series for conventional softwares, Test strategies for object – oriented software, Validation testing, System testing, Debugging

TEXT BOOKS:

1. Carol Britton and Jill Doake, "A Student Guide to Object - Oriented Development", Elsevier, Butterworth – Heinemann, Eighth edition, 2007.

REFERENCE BOOKS:

1. Brett McLaughlin, Gary Pollice and David West, "Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D", O'Reilly, Shroff Publishers & Distributors Pvt. Ltd., 2008.

COURSE OUTCOMES:

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

CO1	List the principles of Information System Design and describe the problems and challenges associated with Information System development.
CO2	Describe System Development life cycle techniques, and Processes for Information System development.
CO3	Apply Investigation about System requirements, Feasibility Analysis for Information System Design.
CO4	Design an Information System that fulfils requirements with regards to System modelling and design.
CO5	Describe the importance of Interface design and their Testing strategies in Information Systems.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	3	3	3	3

REAL TIME SYSTEMS (MCAPE305)

L	T	P	C
3	0	0	3

SYLLABUS:

Module – I: (08 Periods)

Introduction: What is real time, Applications of Real-Time systems, A basic model of Real-time system, Characteristics of Real-time system, Safety and Reliability, Types of Real-time tasks, timing constraints, Modelling timing constraints.

Module – II: (08 Periods)

Real-Time Task Scheduling: Some important concepts, Types of Real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event-Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Some issues Associated with RMA.

Module – III: (08 Periods)

Handling Resource Sharing and dependencies among Real-time Tasks: Resource sharing among real-time tasks. Priority inversion. Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP). Priority Ceiling Protocol (PCP). Different types of priority inversions under PCP important features of PCP.

Module – IV: (08 Periods)

Commercial Real-time operating systems: Time services, Features of a Real-time operating system, Unix as a Real-time operating system, Unix-based Real-time operating systems, Windows as a Real-time operating system, POSIX.

Module – V: **(08 Periods)**

Real-time Communication: Examples of applications requiring real-time communication, Basic concepts, Real-time communication in a LAN. Soft Real-time communication in a LAN. Hard real-time communication in a LAN.

TEXT BOOKS:

1. Real-Time Systems:Jane W.S. Liu, Pearson Education Asia Pub.

REFERENCE BOOKS:

1. Real time Systems: C.M. Krishna & Kang G. Shin, McGraw Hills.

COURSE OUTCOMES:

After learning the Real Time Systems course the students should be able to:

CO1	Enumerate the need and the challenges in the design of hard and soft real time systems.
CO2	Compare different Real time task scheduling algorithms and the schedulability criteria.
CO3	Demonstrate the analytical techniques used in decision making for Resource Sharing, dependencies among Real-time Tasks.
CO4	Demonstrate the Concepts of different commercial real time operating system.
CO5	Integrate Real-Time Communication in Real Time System.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	2	2	3

MOBILE COMPUTING (MCAPE306)

L	T	P	C
3	0	0	3

SYLLABUS:

Module – I: **(08 Periods)**

Introduction, Mobile Communications, Mobile Computing Paradigm. Promises/Novel Applications and impediments and Architecture; GSM Services. System Architecture. Protocols. Localization, Calling, Handover, Security, New Data Services, GPRS

Module – II: **(08 Periods)**

Wireless Medium Access Control: Motivation for a specialized MAC [Hidden and exposed terminals. Near and far terminals], SOMA, FDMA TOMA, COMA, Wireless LAN/[IEEE 802.11], Mobile Network Layer IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration. Tunneling and Encapsulation, Route Optimization, DHCR.

Module – III: **(08 Periods)**

Mobile Transport Layer: Conventional TCP/iP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Module – IV: **(08 Periods)**

Data Dissemination and Synchronization: Communications Asymmetry. Classification of Data Delivery Mechanisms. Data Dissemination, Broadcast Models. Selective Tuning and Indexing Methods.

Module – V: **(08 Periods)**

Mobile Ad hoc Networks: Introduction, Applications a Challenges of a MANET Routing, Classification of Routing Algorithms. Algorithms such as DSR. AODV. DSDV

TEXT BOOKS:

1. "Mobile Communications", Jochen Schiller, Pearson Education, 2nd Edition, 2002

REFERENCE BOOKS:

1. “Wireless Communications: Principles and Practices”, Theodore S. Rappaport, Pearson Education, 2nd Ed, 2002

COURSE OUTCOMES:

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

CO1	Describe wireless and mobile communications systems and be able to choose an appropriate mobile system from a set of requirements.
CO2	Work around the strengths and weaknesses of mobile computing.
CO3	Demonstrate the Interface of a mobile computing system to hardware and networks.
CO4	Design applications on a mobile computing system.
CO5	Analyze and apply the routing protocols in Mobile Ad hoc Networks.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	2	2	2

INTRODUCTION TO DATA SCIENCE (MCAPE307)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module – I **(06 Periods)**

Brief Introduction to Data Science. Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, hypothesis testing.

Module – II **(10 Periods)**

Introduction to Machine Learning: Supervised Learning, Decision Tree Induction, Naïve Bayes Classification, Rule based Classification, K-Nearest Neighbor, Unsupervised Machine learning, Clustering, Association rule mining.

Module – III **(10 Periods)**

Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures, Data pre-processing: Data cleaning, Data transformation, Data reduction.

Module – IV **(06 Periods)**

Feature selection (Filters; Wrappers), Dimensionality reduction: PCA and LDA.

Module – V **(08 Periods)**

Ensemble Learning, Bagging, Boosting, Gradient Boosting (Random Forest, Adaptive Boosting)

TEXT BOOKS:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly. 2014.
2. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.

REFERENCE BOOKS:

1. Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.
2. "Practical Data Science with R". Nina Zumel, John Mount. Manning, 2014

COURSE OUTCOME:

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

CO1	Define basics of Data science concepts.
CO2	Demonstrate the basics of Machine learning including Supervised Learning, Unsupervised Learning, Ensemble Learning, and Reinforcement Learning concepts.
CO3	Analyze the concept of Attribute oriented analysis and implement them to solve various problem.
CO4	Incorporate with feature selection, dimension reduction and associated computing techniques for various applications.
CO5	Demonstrate Ensemble learning and application in data science in software industry.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	3	3	3	3

MACHINE LEARNING (MCAPE308)

L	T	P	C
3	0	0	3

SYLLABUS:

Module – I **(6 Periods)**

Brief Introduction to Machine Learning, Supervised Learning, Unsupervised Learning, Ensemble Learning, Reinforcement Learning

Module – II **(10 Periods)**

Supervised Learning: Decision Tree Induction, Naïve Bayes Classification, Rule based Classification, K-Nearest Neighbor, Linear Regression , Multivariate Regression, SVM

Module – III **(10 Periods)**

Unsupervised Learning: Clustering, Partitioned Clustering, Hierarchical Clustering, BIRCH, CURE, Density based Clustering.

Module – IV **(6 Periods)**

Ensemble Learning, Bagging, Boosting, Gradient Boosting (Random Forest, Adaptive Boosting)

Module – V **(8 Periods)**

Artificial Neural Networks (Early models, Back Propagation, Initialization, Training & Validation), Reinforcement Learning.

Text Books:

1. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008. Christopher Bishop. Pattern Recognition and Machine Learning. 2e.
2. Ethem Alpaydin, Introduction to Machine Learning, Second Edition

Reference Books:

1. Stephen Marsland, Machine Learning: An Algorithmic Perspective.
2. Christopher M. Bishop, Pattern Recognition and Machine Learning.
3. Tom Mitchell, Machine Learning.

COURSE OUTCOME:

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

CO1	Define basics of Machine learning including Supervised Learning, Unsupervised Learning, Ensemble Learning, Reinforcement Learning concepts.
CO2	Demonstrate Supervised Learning techniques and use them in real life problem.
CO3	Get the concept of Unsupervised machine learning techniques and implement them to solve various problem.
CO4	Introduced with advanced machine learning concepts called ensemble learning and they may develop scaling up machine learning techniques and associated computing techniques for various applications.
CO5	Exposed to Artificial Neural network computing and application in data science in software industry.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	3	3	3

INTERNET OF THINGS (MCAPE309)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

MODULE-I **(8 Periods)**

Introduction: What is Internet of Things (IoT) : History of IoT, About IoT, Overview and Motivations, Examples of Applications, Internet of Things Definitions and Frameworks : IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities

MODULE-II : **(8 Periods)**

IoT Mechanisms and Key Technologies: Identification of IoT Objects and Services, Structural Aspects of the IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology.

MODULE-III : **(8 Periods)**

Radio Frequency Identification Technology (RFID): Introduction, Principle of RFID, Components of an RFID system, Issues

EPC Global Architecture Framework: EPCIS & ONS, Design issues, Technological challenges, Security challenges, IP for IoT, Web of Things.

MODULE-IV : **(8 Periods)**

Wireless Sensor Networks: History and Context, WSN Architecture, the Node, Connecting Nodes, Networking Nodes, Securing Communication.

WSN specific IoT Applications and Challenges: Security, QoS, Configuration, Various integration approaches, Data Link Layer protocols, Routing protocols and Infrastructure Establishment.

MODULE-V : **(8 Periods)**

Resource Management in IoT: Clustering, Software Agents, Clustering Principles in an Internet of Things, Architecture, Design Guidelines, and Software Agents for Object Representation, Data Synchronization, Identity portrayal, Identity management, various identity management models: Local, Network, Federated and global web identity, user-centric identity management, device centric identity management and hybrid-identity management, Identity and trust.

Text Books :

1. Rajkamal,"Internet of Things", Tata McGraw Hill publication.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of things(A-Hand-on-Approach)" 1st Edition, Universal Press.
3. Hakima Chaouchi "The Internet of Things: Connecting Objects", Wiley Publication.

Reference Books :

1. Charless Bell "MySQL for the Internet of things", Apress publications.
2. Francis dacosta "Rethinking the Internet of things:A scalable Approach to connecting everything", 1st edition, Apress publications.
3. Donald Norris"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hill publication.

COURSE OUTCOME:

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

CO1	Explain what Internet of Things is.
CO2	Describe key technologies in Internet of Things.
CO3	Describe Radio Frequency Identification Technology (RFID) and EPC Global Architecture Framework.
CO4	Demonstrate Wireless Sensor Network architecture and its framework along with WSN applications.
CO5	Explain Resource Management in Internet of Things.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	-	1	3

BIG DATA ANALYTICS (MCAPE310)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I **(8 Periods)**

Introduction to Big Data: Analytics, Nuances of big data, Value, Issues, Case for Big data, Big data sources, Acquisition, Nuts and Bolts of Big data. Features of Big Data, Security, Compliance, auditing and protection, Evolution of Big data, Best Practices for Big data Analytics, Big data characteristics, Volume, Veracity, Velocity, Variety, Data Appliance and Integration tools.

Module – II **(8 Periods)**

Data Analysis : Evolution of analytic scalability, Convergence, parallel processing systems, Cloud computing, grid computing, map reduce, enterprise analytic sand box, analytic data sets, Analytic methods, analytic tools, Cognos, Microstrategy, Pentaho. Analysis approaches, Statistical significance, business approaches, Analytic innovation, Traditional approaches, Iterative

Module – III **(8 Periods)**

Stream Computing : Introduction to Streams Concepts, Stream data model and architecture, Stream Computing, Sampling data in a stream, Filtering streams, Counting distinct elements in a stream, Estimating moments, Counting oneness in a window, Decaying window, Real-time Analytics Platform(RTAP) applications, IBM Infosphere, Big data at rest, Infosphere streams, Data stage, Statistical analysis, Intelligent scheduler, Infosphere Streams

Module – IV **(8 Periods)**

Predictive Analytics and Visualization : Predictive Analytics, Supervised, Unsupervised learning, Neural networks, Kohonen models, Normal, Deviations from normal patterns, Normal behaviours, Expert options ,Variable entry, Mining Frequent itemsets, Market based model, Apriori Algorithm, Handling large data sets in Main memory, Limited Pass algorithm, Counting frequent itemsets in a stream,

Module–V **(8 Periods)**

Clustering Techniques, Hierarchical, K- Means, Clustering high dimensional data Visualizations, Visual data analysis techniques, interaction techniques; Systems and applications

Text Books:

1. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series
2. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer.

Reference Books:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press.
2. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier

COURSE OUTCOME:

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

CO1	Acquire knowledge on overview of Big Data concepts such as Big data sources, Acquisition, Nuts & Bolts of Big data and Features of Big Data etc.
CO2	Get acquainted with various Data Analysis such as Convergence, analytic data sets, Analytic methods, analytic tools, Analysis approaches and Statistical significance tests etc.
CO3	Demonstrate the Techniques for Stream Computing such as Introduction to Streams Concepts, Stream data model and architecture, Stream Computing, Sampling data in a stream and Filtering streams etc.
CO4	Analyze the Predictive Analytics and Visualization: Predictive Analytics, Supervised, Unsupervised learning, Neural networks and Kohonen models etc.
CO5	Implement Clustering Techniques, Visual data analysis techniques, interaction techniques and application.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	2	3	3	3	3

CYBER LAWS AND SECURITY (MCAPE311)

L	T	P	C
3	0	0	3

SYLLABUS:

Module-I **(08 Periods)**

Introduction to information systems: Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis

Module -II **(08 Periods)**

Application security : Database, E-mail and Internet, Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

Module - III **(08 Periods)**

Developing Secure Information Systems: Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

Module - IV **(08 Periods)**

Security Policies: Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Information Security Standards-ISO.

Module - V **(08 Periods)**

IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

Text Books:

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "**Analysing Computer Security**", Pearson Education India.
2. V.K. Pachghare, "**Cryptography and information Security**", PHI Publishing
3. Schou, Shoemaker, "**Information Assurance for the Enterprise**", Tata McGraw Hill Publishing

Reference Books:

1. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla," **Introduction to Information Security and Cyber Law**", Willey Dreamtech Press.

2. Chander, Harish,"**Cyber Laws And It Protection**" , PHI Learning Private Limited

COURSE OUTCOME:

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

CO1	Analyze the basics of information security and cyber laws.
CO2	Demonstrate the various applications of information security.
CO3	Develop secure information systems.
CO4	Implement the various security policies.
CO5	Implement the various cyber laws and acts followed for information security.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	1	3	3	1	2	1

INTELLECTUAL PROPERTY RIGHTS (MCAPE312)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module – I: Introduction **(08 Periods)**

Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights, Provision of IPR under TRIPS and WTO. Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge

Module – II: Patent Rights **(08 Periods)**

Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties.

Module – III: Copyright **(08 Periods)**

Definition & Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Infringement, Remedies, Copy rights with special reference to software.

Module – IV: Trade Marks **(08 Periods)**

Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties

Module – V: Design & Basic Tenents of Information Technology Act-2000 (08 Periods)

Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention of design- types and functions, Semiconductor Integrated circuits and layout design Act-2000, Cyber crimes, digital signature and E-Commerce.

TEXT BOOKS:

1. Dr. G.B. Reddy, Intellectual Property Rights and the Law, Gogia Law Agency.
2. Dr. B.L.Wadehra, Law relating to Intellectual Property, Universal Law Publishing Co.

REFERENCE BOOKS:

1. Dr.S.R. Myneni, Law of Intellectual Property, Asian Law House

COURSE OUTCOMES:

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

CO1	Express the basic concepts and various kinds of intellectual property rights.
CO2	Define the concepts of patent rights
CO3	Demonstrate the concepts and different types of copyrights.
CO4	Define the concepts and nature of trade marks.
CO5	Describe the features of Information Technology Act-2000 along with the applications of intellectual property rights in E-commerce and cybercrimes

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	1	2	3	3	2	2

WEB TECHNOLOGIES (MCAPE313)

L T P C

3 0 0 3

SYLLABUS:

Module-I (10 Periods)

Introduction: C++ Vs JAVA, JAVA and Internet and WWW, JAVA support systems, JAVA environment. JAVA program structure, Tokens, Statements, JAVA virtual machine, Constant & Variables, Data Types, Declaration of Variables, Scope of Variables, Symbolic Constants, Type Casting. Operators: Arithmetic, Relational, Logical Assignments, Increment and Decrement, Conditional, Bitwise, Special, Expressions & its evaluation. If statement, if…else statement, Nesting of if…else… statements, else…if Ladder, Switch,? Operators, Loops – While, Do, For, Jumps in Loops, Labelled Loops.

Module-II (08 Periods)

Introduction on **Classes & Methods:** Defining a Class, Adding Variables and Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods. Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control. Arrays: One Dimensional & two Dimensional, strings, wrapper Classes, Defining Interface, Extending Interface, Implementing Interface, Accessing Interface Variable, System Packages, Using System Package, Adding a Class to a Package, Hiding Classes.

Module-III (06 Periods)

Internet Principles, Basic Web Concepts, Client/Server model, retrieving data from Internet, HTM and Scripting Languages, Standard Generalized Mark –up languages,

Module-IV (08 Periods)

HTML forms, CGI Concepts, HTML tags Emulation, Server – Browser Communication, E-mail generation, CGI client Side applets, CGI server applets, authorization and security.

Scripting Languages: Dynamic HTML, Cascading style sheets, Object model and Event model, Filters and Transitions, Active X Controls, Multimedia, Client side script, VB Script

programming, Forms, Scripting Object., HTML Tags & Applets, Getting Input from the user.

Module-V **(08 periods)**

Basics on Server side Programming, Servelets & JSP, XML, JSP Technology Introduction, JSP and Servelets, Running JSP Applications, Basic JSP, JavaBeans Classes.

Text Books:

1. Deitel H.M. and Deitel P.J., "**Internet and World Wide Web How to program**", Pearson International.
2. Gopalan N.P. and Akilandeswari J., "**Web Technology***",* Prentice Hall of India
3. Paul Dietel and Harvey Deitel,"**Java How to Program**", Prentice Hall of India
4. E. Balaguruswamy, **"Programming In Java",** TMH Publications

Reference Books:

1. Mahesh P. Matha, "**Core Java A Comprehensive study**", Prentice Hall of India
2. Uttam K.Roy, "**Web Technologies**", Oxford University Press

COURSE OBJECTIVES:

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

CO1	Describe the concepts of various object oriented programming languages and their differences.
CO2	Define the concepts of classes, methods and packages.
CO3	Demonstrate the concepts of standardized mark-up languages along with the concepts of client server model.
CO4	Implement the characteristics of HTML, CGL and scripting languages.
CO5	Implement the basics of server side programming namely servlets, JSP and java-beans classes.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	-	2	3

EMBEDDED SYSTEMS (MCAPE314)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I: (8 Periods)

Introduction to Embedded Systems : Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

MODULE-II: (8 Periods)

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), **Memory:** ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, **Communication Interface:** Onboard and External Communication Interfaces.

MODULE-III: (8 Periods)

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

MODULE-IV: (8 Periods)

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

MODULE-V: (8 Periods)

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, **Task Synchronization:** Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Text Books:

1. Shibu K.V, "**Introduction to Embedded Systems",** McGraw Hill Publishing

Reference Books:

1. Raj Kamal, **"Embedded Systems",** TMH Publishing
2. Frank Vahid, Tony Givargis, **"Embedded System Design",** John Wiley Publishing

COURSE OUTCOME:

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

CO1	Describe the purpose, characteristics, quality attributes and major application areas of embedded systems.
CO2	Demonstrate typical embedded systems, their memory and communication interface.
CO3	Analyse about Embedded Firmware Design approaches and Development Languages.
CO4	Study about RTOS Based Embedded System Design.
CO5	Analyze about different types of task communication and task synchronization issues and techniques.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	2	3	-	1	3

MANAGEMENT INFORMATION SYSTEM (MCAPE315)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

MODULE – I **(08 Periods)**

SYSTEM CONCEPTS: Definition, Computer based user machine system, integrated system, Need for a database, Utilization of models, Evolution, Subsystems, Organizational subsystems, Activities subsystems.

MODULE – II **(08 Periods)**

ORGANIZATIONAL STRUCTURE: Basic model, Hierarchical, Specialization, Formalization, Centralization, Modifications of basic organizational structure, Project

organization, Lateral relations, Matrix organization, Organizational culture and power organizational change.

MODULE – III **(08 Periods)**

STRUCTURE OF MIS: Operating elements, Physical components, Processing functions, Outputs, MIS support for decision making, Structured programmable decisions, Unstructured non-programmable decisions – MIS structure based on management activity and organizational functions, Synthesis of MIS structure

MODULE – IV **(08 Periods)**

SYSTEM SUPPORT: Data representation, Communication network, Distributed systems, Logical data concepts, Physical storage devices, File organizations, Data base organization, Transaction processing.

MODULE – V **(08 Periods)**

DEVELOPMENT AND MANAGEMENT: A contingency approach to choosing an application, Developing strategy, Lifecycle definition stage, Lifecycle development stage, Lifecycle installation and operation stage, Project management.

Text Books:

1. Gordon B. Davis, Margrethe H. Olson, Management Information Systems: Conceptual foundations, Structure and development –2nd Edition – Tata-Mc Graw hill International Book Company, 2000

Reference Books:

1. E.Wainright Martin, Carol V. Brown, Danial W. DeHayes, Jeffrey A. Hoffer, William C. Perkins, "Managing Information Technology" 3rd Edition, Prentice Hall International edition 1999.
2. Harold Koontz, Heinz Weihrich, "Essentials of Management", 5th Edition, Tata McGraw Hill 1998.

COURSE OUTCOMES:

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

CO1	Describe the basic concept of management information systems.
CO2	Demonstrate the organization of management information systems.
CO3	Describe the structure of Management Information System.
CO4	Describe the System Support System, Transaction processing.
CO5	Describe the development and project management.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	2	2	3	1	1	1

ELECTIVE- III & IV

DIGITAL IMAGE PROCESSING (MCAPE401)

L	T	P	C
3	0	0	3

SYLLABUS:

Module – I: **(8 Periods)**

Fundamentals of Image Processing: Introduction, Steps in image processing systems, Image acquisition ,Sampling and Quantization, Pixel relationships, Color fundamentals and models, File formats, Image operations, Arithmetic, Geometric and Morphological.

MODULE - II **(6 Periods)**

Image Enhancement: Spatial Domain: Gray level Transformations, Histogram processing, Spatial filtering smoothing and sharpening. Frequency Domain: Filtering in frequency domain, DFT, FFT, DCT, Smoothing and sharpening filters, Homomorphic Filtering.

MODULE - III **(6 Periods)**

Image Segmentation and Feature Analysis: Detection of Discontinuities, Edge operators, Edge linking and Boundary Detection, Thresholding, Region based segmentation, Morphological Watersheds, Motion Segmentation, Feature Analysis and Extraction.

MODULE - IV **(10 Periods)**

Multi Resolution Analysis and Compressions: Multi Resolution Analysis: Image Pyramids, Multi resolution expansion, Wavelet Transforms. Image compression: Fundamentals, Models, Elements of Information Theory, Error free compression, Lossy Compression, Compression Standards.

MODULE - V **(10 Periods)**

Applications of Image Processing:

Image classification, Image recognition, Image understanding, video motion analysis, Image fusion, Steganography, Digital compositing, Mosaics, Color Image Processing

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearson Education.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Education.

REFERENCE BOOKS:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Thomson Learning.

COURSE OUTCOME:

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

CO1	Describe on the basics of digital image processing and digital image formation. To illustrate different mathematical preliminaries to deal with digital image processing.
CO2	Develop Fourier transform for image processing in frequency domain and image Enhancement: Spatial Domain.
CO3	Evaluate the methodologies for image segmentation, restoration, enhancement, etc.
CO4	Describe the need for image compression and multi resolution analysis and to learn the spatial and frequency domain techniques of image compression.
CO5	Analyze different feature extraction techniques for image analysis and recognition. To be able to implement image process and analysis algorithms. To be able to apply image processing algorithms in practical applications.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	2	1	-	-

DATA MINING (MCAPE402)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module –I **(08 Periods)**

Introduction to Data Mining: What is data mining?, Related technologies - Machine Learning, DBMS, OLAP, Statistics, Data Mining Goals, Stages of the Data Mining Process, Data Mining Techniques, Knowledge discovery from Data, Applications.

Module –II **(10 Periods)**

Association rules and Frequent pattern mining: Motivation and terminology**,** Basic idea about item sets, Generating item sets and rules efficiently, Market basket analysis, Apriori Algorithm, FP Growth Tree Algorithm, Correlation analysis**.**

Module – III **(10 periods)**

Data Mining Tasks: Classification (Basic learning/mining tasks, Inferring rudimentary rules: Decision trees, Covering rules), Prediction (The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbour), Linear models)

Module – IV **(6 periods)**

Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures, **Data pre-processing:** Data cleaning, Data transformation, Data reduction.

Module – V **(6 Periods)**

Data Warehouse, OLAP and OLTP: Data Warehouse and DBMS**,** Multidimensional data model, OLAP operations.

Text Books:

1. J. Han and M. Kamber, "**Data Mining: Concepts and Techniques**",Morgan Kaufman Publisher
2. H. Witten and E. Frank, "**Data Mining: Practical Machine Learning Tools and Techniques**", Morgan Kaufmann Publisher

Reference Books:

1. M. H. Dunham. Data Mining, "**Introductory and Advanced Topics**" Pearson Education Publisher
2. D. Hand, H. Mannila and P. Smyth,"**Principles of Data Mining**" Prentice-Hall Publisher

COURSE OUTCOME:

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

CO1	Describe the overview of Data Mining, Data Warehouse and OLAP. Able to understand the knowledge representation in Data mining.
CO2	Implement Association rules and frequent pattern mining to solve real life problem.
CO3	Acquire ability to understand and use data mining task such as classification prediction and clustering to solve various real and challenging problems. Students will be able to excel himself/herself as a design engineer in any industries/R&D sector, particularly in the area of Data science.
CO4	Get insight concept of attribute oriented analysis and data preprocessing task in data mining.
CO5	Excel himself/herself in to the concept of data warehouse, OLAP and OLTP and Capable to work in future Data Science software industry.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	3	3	3	3

ADVANCE COMPUTER NETWORK (MCAPE403)

L	T	P	C
3	0	0	3

SYLLABUS:

Module-I **(10 Periods)**

Overview and basics of Internet: TCP/IP protocol suit, **Multiplexing and Local area networks:** Multiplexing, Types of Multiplexing- FDM, TDM, SM; - Ethernet, token ring, FDDI; switching - circuit switching, packet switching, multicasting.

SONET/SDH standards, Dense Wavelength division multiplexing (DWDM), switching and telephone networks, wireless WAN: Cellular Telephone and Satellite Networks.

Module-II **(05 Periods)**

Virtual-Circuit Networks: Frame Relay and ATM, **Wired LANs:** Ethernet, Connecting LANs, Backbone Networks, and Virtual LANs, Congestion Control and Quality of service, **Network layer:** Addressing, IP versions, Address Mapping, Error Reporting, and Multicasting.

Module-III **(10 Periods)**

Routing Algorithms: The Optimality Principle, Hierarchical Routing, Broadcast Routing, Mul, ticast Routing, Routing for Mobile Hosts. **Multi-Media over Internet:** RTP, RSVP, IP Multicasting, Voice Digitization standards, G.729 and G.723 and H.323. **Routing in the Internet:** Intra and inter domain routing, Unicast, RIP, OSPF, BGP; Multicast Routing Protocols: MOSPF, DVMRP, Drawbacks of traditional routing methods, IP over ATM, Multi-protocol Label switching (MPLS), and Storage Area Networks (SAN).

Module-IV **(06 Periods)**

Internetworking: Networks Differences, Connecting Networks, Concatenated Virtual Circuits, Connection less Internetworking, Tunneling, Internetwork Routing, Fragmentation, **Network Layer in the Internet**: The IP Protocol, IP Addresses, Internet Control Protocols, OSPF-The Interior Gateway Routing Protocol, BGP-The Exterior Gateway Routing Protocol, Internet Multicasting.

Module -V **(10 Periods)**

Application Layer: Multimedia: Introduction to Digital Audio, Audio Compression, Streaming Audio,Voice over IP, Introduction to Video, Video Compression, Video on Demand, The MBone – The Multicast Backbone, Network Security, Network Security, Cryptography and Network Security, Symmetric Key Algorithms, Public Key Algorithms, Digital Signatures, Management of Public Keys, Communication Security, And Web Security, **Enterprise Network Security:** DMZ, NAT, SNAT, DNAT, Security in Internet, E-mail Security.

Text Books:

1. Data Communication and Networking 5E Forouzan Behrouz A. McGraw Hill Education (India), New Delhi, 2005, ISBN-13:978-1-25-906475-3
2. 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
3. Computer Networks, Fourth Edition Tanenbaum Andrew S. PHI Learning, New Delhi- 2014 ISBN-81 -203 -2175-8

Reference Books:

1. Advanced Computer Network B.M. Harwani and DT Editorial Services Dreamtech New Delhi- 2014 ISBN 978-93-5004-013-3
2. Computer Networks Principles, Technologies and Protocols for Network Design Natalia Olifer, Victor Olifer Wiley ISBN

COURSE OUTCOME:

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

CO1	Describe the other network techniques used in physical layer of computer networks.
CO2	Demonstrate the applications of Local Area Networks in different areas.
CO3	Implement relevant routing Protocol for the given network situation.
CO4	Describe the tunneling concepts and uses of gateways routing protocols.
CO5	Incorporate with the application of application layer protocols and essential security in internet.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	2	-	2	3

DISTRIBUTED OPERATING SYSTEM (MCAPE404)

L	T	P	C
3	0	0	3

SYLLABUS:

Module-I (08 Periods)

Distributed Computing System: Introduction, Evolution of Distributed Computing Systems, Distributed Computing System Models, Reason for Popularity, Distributed Operating System Issues in Designing a Distributed Operating System, Distributed Computing Environment (DCE), Computer Networks Types, LAN Technologies, WAN Technologies, Communication Protocols, Internetworking, ATM Technology

Module-II (08 Periods)

Message Passing: Introduction, Desirable Features of a Good Message-Passing System, Issues in IPC by Message Passing, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.

Module-III (08 Periods)

Remote Procedure Calls: Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshalling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs.

Module-IV **(08 Periods)**

Distributed Shared Memory: Introduction, General Architecture of DSM Systerns, Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy Thrashing, Other Approaches to DSM, Heterogeneous DSM, Advantages of DSM.

Module -V **(08 Periods)**

Synchronization: Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms

Text Books:

1. Distributed Computing by Sunita Mahajan & Seema Shah, OXFORD Books

2. Distributed Operating Systems by Andrew S Tannebaum, Pearson Publications

Reference Books:

1. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,Tim Kindberg, Pearson Publications

2. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, Hagit Attiya and Jennifer Welch, Wiley India

COURSE OUTCOME:

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

CO1	List the principles of distributed systems and describe the problems and challenges associated with these principles.
CO2	Implement Distributed Computing techniques, and Processes.
CO3	Apply Message Passing and RPC concepts for communication in distributed environment.
CO4	Design a distributed system that fulfils requirements with regards to key distributed systems properties like Distributed Shared Memory.
CO5	Describe the importance of synchronization in distributed systems.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	3	2	1	1

CLOUD COMPUTING (MCAPE405)

L	T	P	C
3	0	0	3

SYLLABUS:

Module-I **(08 Periods)**

Basics of Cloud Computing: Introduction, Evolution of Cloud Computing, Cluster Computing, Grid Computing, Mobile Computing, Popular Views, Characteristics of Cloud Computing.

Module-II **(08 Periods)**

Introduction to Cloud Computing: Need for Cloud Computing, Types of Cloud Deployment Models, Types of Cloud Service Models, Security Paradigms and Issues of Cloud Computing, Some Popular Cloud Service Providers for PaaS, SaaS, IaaS, NIST Cloud Architecture.

Module-III **(08 Periods)**

Cloud Framework: Introduction, Framework for Cloud Computing Environment, Service Oriented Architecture (SOA), Life Cycle of Services in SOA Integrating SOA and the Cloud, Cloud Framework, Framework Constraints, Workflow and Co-ordination of Multiple Activities, Need of Workflow, Examples of Workflow Tools

Module-IV **(08 Periods)**

Virtualization: Introduction, Needs of Virtualization in Cloud Computing Environment, Advantages of Virtualization Technique in Cloud Computing Environment, Category of Virtual Machine, Virtualization Model for Cloud Computing, Categorization of Guest OS Virtualization Techniques, Mapping Technique of Virtual Machine to Physical Machine in a Private Cloud, Draw Backs of Virtualization

Module-V **(08 Periods)**

Computing Platforms and Technologies: Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Case Studies: Application Paradigms of Cloud Computing, Security Threats and Protection in Cloud Computing

Text Books

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola,S.Thamarai Selvi, TMH.

2. George Reese Cloud Application Architectures, First Edition, O'Reilly Media.

References Books:

1. Cloud Computing and SOA Convergence in Your Enterprise A Step-by-Step Guide by David S. Linthicum, Pearson.

2. Cloud Computing, Dr. Kumar Saurabh, Wiley India.

COURSE OUTCOME:

After learning the Cloud Computing course the students should be able to:

CO1	Compare the strengths and limitations of cloud computing.
CO2	Identify the architecture, infrastructure and delivery models of cloud computing.
CO3	Describe the role of SOA Technologies and Workflow framework.
CO4	Apply suitable virtualization concept.
CO5	Choose the appropriate Cloud application, Programming Model and approach based on security and threats.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	3	2	2

SIMULATION AND MODELLING (MCAPE406)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I: (8 Periods)

Inventory Concept: The technique of Simulation, Major application areas, concept of a System, Environment, Continuous and Discrete systems, System Modeling, Types of models, Progress of a Simulation Study, Monte Carlo Method, Comparison of Simulation and Analytical Methods. Numerical Computation Technique for discrete and continuous models, Continuous System Simulation.

MODULE-II: (8 Periods)

Probability Concepts in Simulation: Stochastic variables, Discrete and Continuous Probability Functions, Numerical evaluation of continuous probability functions, continuous uniformly distributed random numbers, Random Number Generators – Linear Congruential Generator, Additive and Multiplicative Congruential Generators, Mid Square Method, Rejection Method, Testing of random numbers, Generation of Stochastic Variates, Arrival Patterns, Service Times.

MODULE-III: (8 Periods)

Discrete System Simulation: Discrete Events, Representation of Time, Generation of Arrival Patterns, Fixed Time Step versus Next Event Simulation, Simulation of a Telephone System, Delayed Calls.

MODULE-IV: (8 Periods)

Introduction to GPSS: Creating and moving transactions, queues, facilities and storages, gathering statistics, conditional transfers, program control statements, priorities and parameters, standard numerical attributes, functions, gates, logic switches and tests, Variables, Select and Count, Example GPSS problems.

MODULE-V: (8 Periods)

Simulation Languages and Practical Systems: Continuous and Discrete Systems Languages, Factors in the selection of Discrete Systems Simulation Language, Computer Model of Queuing, Inventory and Scheduling Systems. **Design and Evaluation of Simulation Experiments:** Length of Simulation Runs, Validation, Variance Reduction Techniques, Experimental Layout, Analysis of Simulation Output, Recent Trends and Developments.

Text Books:

1. Geoffrey Gordon, "**System Simulation**", PHI Publication.
2. Narsingh Deo, "**System Simulation with Digital computer**", PHI Publication.

Reference Books:

1. Jerry Banks and John S.Carson, Barry L. Nelson, David M.Nicol, "**Discrete Event System Simulation**", 3rd Edition, Prentice Hall Publication.
2. Shannon, R.E, "**Systems simulation, The art and science**", Prentice Hall Publication.
3. Thomas J. Schriber, "**Simulation using GPSS**", John Wiley Publication.

COURSE OUTCOME:

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

CO1	Describe the technique of simulation and different types of system models.
CO2	Define the probability concepts in simulation and study different random number generator techniques along with standard tests for random numbers.
CO3	Demonstrate discrete system simulation like the simulation of a telephone system.
CO4	Implement GPSS language and various GPSS programs.
CO5	Describe computer models of queueing, inventory and scheduling systems, Variance Reduction techniques and analysis of simulation output.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	-	1	3

WIRELESS SENSOR NETWORK (MCAPE407)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I: (06 Periods)

Overview of Wireless Sensor Networks: Introduction, Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

MODULE-II: (10 Periods)

Architectures: Single-Node Architecture, Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

MODULE-III: (10 Periods)

Networking Sensors: Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing.

MODULE-IV: (08 Periods)

Infrastructure Establishment: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

MODULE-V: (06 Periods)

Sensor Network Platforms and Tools: Sensor Node Hardware, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming

Text Books:

1. Holger Karl & Andreas Willig,"**Protocols and Architectures for Wireless Sensor Networks**", John Wiley.
2. Anna Hac, "**Wireless Sensor Network Designs**", John Wiley & Sons.

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Reference Books:

1. Edgar H. Callaway, Jr. and Edgar H. Callaway, "**Wireless Sensor Networks: Architectures and Protocols**," CRC Press.

2. Victor Lesser, Charles L. Ortiz, and Milind Tambe, "**Distributed Sensor Networks: A Multiagent Perspective**," Kluwer Publishing

COURSE OUTCOME:

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

CO1	Describe the challenges and enabling technologies for Wireless Sensor Networks.
CO2	Construct the architecture, energy consumption, Operating Systems and Execution Environments for Wireless Sensor Networks.
CO3	Demonstrate about networking sensors and MAC protocols for Wireless Sensor Networks.
CO4	Analyse different Infrastructure Establishment techniques for Wireless Sensor Networks.
CO5	Describe about Sensor Node Hardware and Software platforms, Node-level Simulators and State-centric Programming.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	2	3	-	1	3

SOFTWARE PROJECT MANAGEMENT (MCAPE408)

L	**T**	**P**	**C**
3	**0**	**0**	**3**

SYLLABUS:

Module-I **(10 Periods)**

Introduction to Software Project Management: Project Definition, Contract Management, Activities Covered by Software Project Management, Overview Of Project Planning, plan methods, methodology.

Project Evaluation: Strategic Assessment, Technical Assessment, Cost Benefit Analysis, Cash Flow Forecasting, Cost Benefit Evaluation Techniques, Risk Evaluation, **selection of project approach:** discussion on models, choice of process models.

Module-II **(07 Periods)**

Activity Planning : Objectives, Project Schedule, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass, Backward Pass, Activity Float, Shortening Project Duration, Activity on Arrow Networks, **Risk Management:** Nature Of Risk, Types Of Risk, Managing Risk, Hazard Identification, Hazard Analysis, Risk Planning And Control.

Module-III **(08 Periods)**

Monitoring and Control: Creating Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value analysis, Prioritizing Monitoring, Getting Project Back to Target, Change Control, **Managing Contracts:** Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.

Module-IV **(05 Periods)**

Resource allocation: introduction and nature of resources, identification of resource requirements, scheduling, creating critical path, cost schedule, counting cost**.**
Effortestimation: basics of software estimation, techniques, COCOMO-II, cost, staffing pattern.

Module-V **(10 Periods)**

Managing People and Organizing Teams: Introduction, Understanding Behaviour, Organizational Behaviour: Background, Selecting The Right Person For The Job, Instruction In The Best Methods, Motivation , The Oldman, Hackman Job Characteristics Model, Working In Groups, Becoming A Team, Decision Making, Leadership, Organizational Structures, Stress, Health And Safety

Text Books:

1. Bob Hughes, Mikecotterell**, "Software Project Management",** Tata McGraw Hill Publishing

Reference Books:

1. Ramesh, Gopalaswamy, "**Managing Global Projects**", Tata McGraw Hill Publishing
2. Royce, "**Software Project Management**", Pearson Education Publishing
3. Jalote, "**Software Project Management in Practice**", Pearson Education Publishing

COURSE OUTCOME:

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

CO1	Identify the different project contexts and suggest an appropriate project management strategy.
CO2	Practice the role of project planning, risks associated in successful software development.
CO3	Identify and describe the key phases of project monitoring and contracts in management.
CO4	Demonstrate the role of resource allocation and effort estimation in project management process.
CO5	Apply the concept of project management and planning on organizing team and people's behaviour.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	2	2	1	3	2	2

ADVANCE DATABASE MANAGEMENT SYSTEM (MCAPE409)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I **(8 Periods)**

Formal review of relational database and FDs Implication, Closure, its correctness.

MODULE-II **(8 Periods)**

3NF and BCNF, Decomposition and synthesis approaches, Review of SQL99, Basics of query processing, external sorting, file scans.

MODULE-III **(8 Periods)**

Processing of joins, materialized vs. pipelined processing, query transformation rules, DB transactions, ACID properties, interleaved executions, schedules, serialisability.

MODULE-IV **(8 Periods)**

Correctness of interleaved execution, Locking and management of locks, 2PL, deadlocks, multiple level granularity, CC on B+ trees, Optimistic CC.

MODULE-V **(8 Periods)**

T/O based techniques, Multiversion approaches, Comparison of CC methods, dynamic databases, Failure classification, recovery algorithm, XML and relational databases.

TEXT BOOKS:

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004
2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

REFERENCES:

1. R.Elmasri, S.B Navathe, "**Fundamentals of Database System**", Adesion Wesley Publishing

COURSE OUTCOME:

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

CO1	Describe relational database and FDs Implication, Closure, its correctness.
CO2	Describe Decomposition and synthesis approaches and Basics of query processing.
CO3	Demonstrate DB transactions, ACID properties.
CO4	Demonstrate locks, 2PL, deadlocks, multiple level granularity.
CO5	Analyse T/O based techniques, Multiversion approaches, XML and relational databases.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	2	3	2	1	1

DATA ANALYTICS (MCAPE410)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I (8 Periods)

INTRODUCTION TO BIG DATA: Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

MODULE-II (8 Periods)

DATA ANALYSIS: Regression modelling, Multivariate analysis, Bayesian modelling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

MODULE-III (8 Periods)

MINING DATA STREAMS: Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Real-time Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions.

MODULE-IV (8 Periods)

FREQUENT ITEMSETS AND CLUSTERING: Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

MODULE-V (8 Periods)

FRAMEWORKS AND VISUALIZATION: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.

TEXT BOOKS:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.

2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics, John Wiley & sons, 2012.

2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O‟Reilly, 2011.

3. Jiawei Han, Micheline

COURSE OUTCOME:

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

CO1	Exposed to big data.
CO2	Demonstrate the different ways of Data Analysis.
CO3	Be familiar with data streams.
CO4	Describe the mining and clustering.
CO5	Be familiar with the visualization.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	3	3	3	3

ADVANCE COMPUTER ARCHITECTURE (MCAPE411)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I **(8 Periods)**

Pipeline and vector processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

MODULE-II **(8 Periods)**

Computer Arithmetic: Addition and Subtraction, Hardware Implementation, Multiplication Algorithms and Hardware Implementation, Division Algorithms and Hardware Implementation, Floating Point Arithmetic Operations.

MODULE-III **(8 Periods)**

Parallel Computer Models: Evolution of Computer Architecture, System Attributes to Performance, Shared Memory Multiprocessors, Distributed Memory Multicomputer, Vector Super Computers, SIMD Super Computers.

MODULE-IV **(8 Periods)**

Processors and Memory Hierarchy : Advanced Processor Technology: Design Space of Processors, Instruction-Set Architectures, CISC scalar Processors, RISC scalar Processors, Super Scalar and Vector Processors: Superscalar Processors.

MODULE-V **(8 Periods)**

Pipelining and Superscalar Techniques : Linear Pipeline Processors: Asynchronous and Synchronous models, Clocking and Timing Control, Speedup, Efficiency and Throughput, Pipeline Schedule Optimization, Instruction Pipeline Design: Instruction Execution Phases, Mechanisms for Instruction Pipelining, Dynamic Instruction Scheduling, Branch Handling Techniques.

Text Books

1. Computer System Architecture, Morris M. Mano, 3rd edition, Pearson/Prentice Hall India.

2. Advanced Computer Architecture, Kai Hwang, McGraw-Hill, India.

Reference Books

1. Computer Organization and Achitecture, William Stallings ,8th edition,PHI

2. Computer Organization, Carl Hamachar, Vranesic,Zaky, 5th edition, McGraw Hill.

COURSE OUTCOMES:

After learning the Advance Computer Architecture course the students should be able to:

CO1	Describe the Concept of Parallel Processing and its applications.
CO2	Implement the Hardware, concepts for different Arithmetic Operations.
CO3	Analyze the performance of different scalar Computers.
CO4	Develop the Pipelining Concept for a given set of Instructions.
CO5	Distinguish the performance of pipelining and non-pipelining environment in a processor.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	3	2	-	1	3

INTELIGENT DATA ANALYSIS (MCAPE412)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I (8 Periods)

Big Data Overview - Data Structures, Analyst Perspective on Data Repositories, State of the Practice in Analytics, BI Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data .

MODULE-II (8 Periods)

Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize Case Study.

MODULE-III (8 Periods)

Overview of Clustering, K-means, Use Cases, Overview of the Method, Determining the Number of Clusters, Diagnostics, Reasons to choose and Cautions, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, Validation and Testing, Diagnostics.

MODULE-IV (8 Periods)

Linear Regression, Logistic Regression, Reasons to Choose and Cautions, Decision Trees, Naïve Bayes, Bayes Theorem, Naïve Bayes Classifier, Diagnostics of Classifiers.

MODULE-V (8 Periods)

Introduction to R, R Graphical User Interfaces, Data Import and Export, Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization, Before Analysis, Analytics for unstructured data MapReduce, Apache Hadoop, Hadoop Ecosystem.

Text Books

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.

2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Reference Books

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.

2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)

COURSE OUTCOMES:

After learning the Intelligent Data Analysis course the students should be able to:

CO1	Address the principles of Big Data and its difference to Data Analytics.
CO2	Describe the life cycle phases of Data Analytics through discovery, planning and building.
CO3	Demonstrate the analytical techniques used in decision making.
CO4	Employ tools and technologies to analyze Big data.
CO5	Apply R tool for developing real time applications.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	2	3	3	1	1	-

DEEP LEARNING (MCAPE413)

L	T	P	C
3	0	0	3

SYLLABUS:

Module – I **(08 Periods)**
Introduction to Deep Learning, History of Deep Learning, Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning.

Module – II **(08 Periods)**
Regularization: Bias Variance Tradeo-, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying. Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization

Module – III **(08 Periods)**
Recurrent Neural Networks, Backpropagation through time, LSTM, GRU

Module – IV **(08 Periods)**
Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet.

Module – V **(08 Periods)**
Unsupervised Learning with Deep Network, Restricted Boltzmann Machine, Deep Belief Network, Autoencoders

Text Books:

1. Deep Learning from Scratch: Building with Python from First Principles, Seth Weidman, O'REILLY

2. Fundamentals of Deep Learning, Nikhil Buduma, O'REILLY

COURSE OUTCOME:

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

CO1	Describe the Introduction to Neural Network, Deep Learning, and History of Deep Learning, Introduction to Neural Network.
CO2	Define the concepts of regularization in the contexts of neural network training.
CO3	Implement the recurrent neural network and use them to solve real life problem.
CO4	Define the concept of Convolutional Neural Network and it implementation.
CO5	Implement unsupervised deep learning techniques.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	PO2	PO3	PO4	PO5	PO6
CO	3	3	3	3	3	3

E-COMMERCE AND ERP (MCAPE414)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE-I **(8 Periods)**

Introduction to E-commerce: Introduction, E-commerce or Electronic Commerce- An Overview, Electronic Commerce – Cutting edge, Electronic Commerce Framework

Evolution of E-commerce: Introduction, History of Electronic Commerce, Advantages and Disadvantage of E-commerce, Roadmap of e-commerce in India

Module-II **(10 Periods)**

Network Infrastructure: Introduction, Network Infrastructure- an Overview, The Internet Hierarchy, Basic Blocks of e-commerce, Networks layers & TCP/IP protocols, The Advantages of Internet, World Wide Web **E-commerce Infrastructure:** Introduction, E-commerce Infrastructure-An Overview, Hardware, Server Operating System, Software, Network Website

Module-III **(6 Periods)**

Managing the e-Enterprise: Introduction, e-Enterprise, Managing the e-Enterprise, E-business Enterprise, Comparison between Conventional Design and E-organization, Organization of Business in an e-Enterprise.

Module-IV **(8 Periods)**

e-Commerce Process Models: Introduction, Business Models, E-business Models Based on the Relationship of Transaction Parties, e-commerce Sales Life Cycle (ESLC) Model.

Management of Risk: Introduction, Risk, Introduction to Risk Management, Disaster recovery plans, Risk management Paradigm.

Module-V **(8 periods)**

Electronic Data Interchange(EDI): The Meaning of EDI, History of EDI, EDI Working Concept, Implementation difficulties of EDI, Financial EDI, EDI and Internet
E-Marketing: The scope of E-Marketing, Internet Marketing Techniques
Website Design Issues: Factors that Make People Return to Your Site, Strategies for Website Development

Text Books:

1. David Whitley, "**E-Commerce-Strategy, Technologies & Applications**", TMH Publishing
2. Kamlesh K. Bajaj, "**E-Commerce- The cutting edge of Business**", TMH Publishing

Reference Books:

1. Ravi Kalakota & Andrew B Whinston, "**Frontiers of Electronic Commerce**", Pearson Education.

COURSE OUTCOMES:

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

CO1	Demonstrate the evolution, foundations and importance of e-commerce with progressions.
CO2	Describe the network infrastructure of the e-commerce and its impact through the world wide system.
CO3	Analyse the impact of e-commerce on business model and enterprise strategy.
CO4	Describe the process model life cycles and risks and issues associated with the e-commerce management system.
CO5	Analyse the data interchange in e-commerce, scope of the marketing techniques and marketing strategy through internet, intranet and extranet communication.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	1	3	2	3	2	2

COMPUTER GRAPHICS AND MULTIMEDIA (MCAPE415)

L	T	P	C
3	0	0	3

SYLLABUS:

Module-I **(10 Periods)**

Introduction to Computer Graphics & Graphics Systems : Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software. **Scan conversion:** Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; scan conversion of a character, polygon filling algorithm, flood fill algorithm.

Module – II **(8 Periods)**

2D Transformation & Viewing : Basic transformations: translation , rotation, scaling ; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines , parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation, clipping operations - line clipping, clipping polygons

Module – III **(8 Periods)**

3D Transformation & Viewing: 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Module – IV **(8 Periods)**

Curves: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. **Hidden surfaces:** Depth comparison, Z-buffer algorithm, back face detection, scan-line algorithm; Hidden line elimination, wire frame methods

Module – V **(6 Periods)**

Multimedia: Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia. Image, video and audio standards. Audio: digital audio, MIDI, processing sound, sampling, compression. Video: MPEG compression standards, compression through spatial and temporal redundancy, inter-frame and intraframe compression. Animation: types, techniques, key frame animation, utility, morphing.

Text Books:

1. Hearn, Baker, " **Computer Graphics (C version)**", Pearson education
2. Udit Agarwal, " **Computer Graphics**", S.K. Kataria & Sons Publication
3. D. F. Rogers, J. A. Adams, " **Mathematical Elements for Computer Graphics**" – Tata McGraw Hill Publication

4. Mukherjee, "**Fundamentals of Computer Graphics & Multimedia**", PHI

Reference Books:

1. Andleigh & Thakrar, "**Multimedia**", PHI Publication
2. Mukherjee Arup, "**Introduction to Computer Graphics**", Vikas Publication

COURSE OUTCOME:

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

CO1	Demonstrate the Practical concepts of Graphics display devices, different types of graphics drawing algorithms.
CO2	Define the concepts how to use of 2D and 3DGeometricalTransformations.
CO3	Implement the practical concepts of Hidden Line/surface elimination techniques.
CO4	Define the concepts of Viewing, Curves and surfaces.
CO5	Demonstrate the concept of Multimedia and also the concept of Computer Animation.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	3	2	1	-	-	1

COMPUTER BASED OPTIMIZATION TECHNIQUES (MCAPE416)

L	T	P	C
3	0	0	3

SYLLABUS:

MODULE – I **(08 Periods)**

Linear Programming: Mathematical formulation, Graphical methods of solution, general properties, Simplex method, Duality, dual simplex, post-optimality analysis.

MODULE – II **(08 Periods)**

Transportation and Assignment Problems: Transportation and transshipment problems, assignment problems, sample programs.

MODULE – III **(08 Periods)**

Network analysis, CPM and PERT: Shorter route problem, maximal flow problem, project scheduling, critical path calculations, PERT calculations, Sample programs.

MODULE – IV **(08 Periods)**

Inventory models: Deterministic inventory models, infinite delivery rate with no backorders, infinite delivery rate with back orders, finite delivery rate with back orders. Introduction to probabilistic inventory models, sample programs.

MODULE – V **(08 Periods)**

Sequencing models: Processing of n jobs through m2 machines, n jobs through 3 machines, 2 jobs through m machines, maintenance crew scheduling.

Text Books:

1. Operations Research – Kanti Swarup, P.K. Gupta, Man Mohan (Sultan Chand & Sons).

Reference Books:

1. Operations Research: An Introduction – Hamdy A. Taha (Prentice Hall of India)

2. Introduction to Operations Research:Computer oriented Algorithmic(Mc Graw

Hill 1976)

3. Quantitative Techniques in Management – Volma N.D (T.M.II 1990)

4. Operations Research for management – Shenoy G. VSrivastava& Sharma (Wiley

Eastern II edition)

COURSE OUTCOMES:

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

CO1	Describe the Linear Programming and mathematical formulation.
CO2	Describe the Transportation and Assignment Problems.
CO3	Describe the Network analysis methods.
CO4	Describe the different inventory models.
CO5	Describe the Sequencing modelling and crew scheduling.

Course Articulation Matrix:

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) -: No Correlation

Program Articulation Matrix row for this Course:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO	2	2	3	1	1	1