MEDI-CAPS UNIVERSITY

Knowledge is Power

Department of Computer Applications

CURRICULUM AND SYLLABUS

(2023-2025)

Master of Computer Application

Computer Applications

MCA

CURRICULUM AND SYLLABUS

Vision Statement of University

Be an internationally acclaimed University recognised for its excellent teaching, research, innovation, outreach and creating top class technocrats and professionals who can serve the mankind as multi skilled global citizen.

Mission Statement of University

- Establish state-of-the-art facilities for world class education and research.
- Conduct scholarly research and creative endeavours that impact quality of life.
- Attract quality staff and students to cater for diverse needs and preferences and widen participation.
- Build a foundation for students to be successful at all levels through high-quality, innovative programs.
- Collaborate with institute, industry, and society to address current issues through research and align curriculum.
- Involve in societal outreach programs to identify concerns and provide sustainable ethical solutions.
- Encourage life-long learning and team-based problem solving through an enabling environment.

Vision of the Department:

To generate technically competent and skilled intellectual professionals in computer applications who can provide sustainable solutions to the societal and industrial needs.

Mission of the Department:

1. Attracting experienced faculty members and expert research professionals for creating an outstanding academic environment.
2. Maintaining state of the art research facilities to provide collaborative environment that stimulates faculty, staff and students with opportunities to create, analyse, apply and disseminate knowledge.
3. Providing globally competitive education to students in order to enhance their skills to meet the future challenges.
4. Providing excellent academic environment to students for inculcating practical approach for lifelong learning and bright career.

Department of Computer Applications

Program Education Objectives (PEOs)

The Program Educational Objectives of MCA program are:

PEO_{01}	To prepare professionals who will be successful in industry, government, academia, research, entrepreneurial pursuit and consulting firms.
PEO_{02}	To prepare professionals who will contribute to society as broadly educated, expressive, ethical and responsible citizens with proven expertise.
PEO_{03}	To prepare professionals who will achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.

Department of Computer Applications

PROGRAMME OUTCOMES (POs)

MCA program has been designed to prepare professionals for attaining the

PO_{01}	An ability to apply knowledge of mathematics, computer science and management in practice.
PO_{02}	An ability to identify, critically analyze, formulate and develop computer applications.
PO_{03}	An ability to design a computing system to meet desired needs within realistic constraints such as safety, security and applicability.
PO_{04}	An ability to apply knowledge of design of experiment and data analysis to derive solutions in complex computing problems.
PO_{05}	An ability to select modern computing tools and techniques and use them with dexterity.
PO_{06}	An ability to recognize the social, professional, cultural and ethical issues involved in the use of computer technology and give them due consideration in developing software systems.
PO_{07}	An ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.
PO_{08}	Applying ethical principles and commitment to ethics of IT and software profession.
PO_{09}	An ability to work effectively as an individual as well as in teams.
PO_{10}	An ability to communicate effectively with the technical community and society.
PO_{11}	Demonstrating and applying the knowledge of computer application and management principles in software project development and in multidisciplinary areas.
PO_{12}	An ability to appreciate the importance of goal setting and to recognize the need for life-long learning.

Department of Computer Applications

Choice Based Credit System Scheme- MCA

Batch 2023-2025

First Year - Semester I (Odd Sem)

Sr. No.	CourseCode	Courses	L	T	P	Credit
1	CA5BS04	Mathematics of Computer Applications	4	0	0	4
2	CA5CO33	Advanced C Programming	4	0	0	4
3	CA5CO34	Data Structures and Algorithm	4	0	0	4
4	CA5CO35	Modern Operating System	4	0	0	4
5	CA5CO38	Advanced Database Management System	3	0	0	3
6	CA5CO23	Programming Lab I	0	0	2	1
7	CA5CO24	Database Lab	0	0	2	1
8	CA5CO10	Data Structures Lab	0	0	4	2
9	CA5MC02	Technical Communication and Soft Skills	2	0	0	0
		Total	**21**	**0**	**8**	**23**
		Total Contact Hours	**29**			

Department of Computer Applications

Choice Based Credit System Scheme- MCA

Batch 2023-2025

First Year- Semester II (Even Sem)

SEMESTER II						
S.N.	**Course Code**	**Courses**	**L**	**T**	**P**	**Credit**
1	CA5CO25	Software Engineering Principles	3	0	0	3
2	CA5CO26	Computer Networks Fundamental	3	0	0	3
3	Elective - I	Elective - I	3	0	0	3
4	Elective - II	Elective - II	3	0	0	3
5	CA5EL49	Theory of Computation	4	0	0	4
6	Open Elective - I	Open Elective - I	3	0	0	3
7	CA5CO27	Programming Lab II	0	0	2	1
8	CA5CO28	Advance Programming Lab I	0	0	4	2
9	CA5CO29	Computer Networks Lab	0	0	2	1
10	CA5MC04	Personality Development & Quantitative Aptitude	3	0	0	0
		Total	**22**			**23**
		Total Contact Hours	**30**			

Electives

CA5EL54	Programming in Python
CA5EL01	Object Oriented Programming Paradigm
CA5EL04	Artificial Intelligence
CA5EL05	Design and Analysis of Algorithms
CA5EL21	Information Storage and Management

Open Elective - I

OE00082	Advanced Object Oriented Programming

Department of Computer Applications

Choice Based Credit System Scheme- MCA

Batch 2023-2025

Model Scheme for MCA (Batch 2023-25) Second Year -

Semester III (Odd Sem)

SEMESTER – III						
S.N.	**Course Code**	**Courses**	**L**	**T**	**P**	**Credit**
1	CA5CO30	Internet & Web Technologies	3	0	0	3
2	Elective - III	Elective - III	4	0	0	4
3	Elective - IV	Elective - IV	4	0	0	4
4	Elective - V	Elective - V	4	0	0	4
5	Open Elective - II	Open Elective - II	3	0	0	3
6	CA5CO37	Mobile Application Development Lab	0	0	2	1
7	CA5CO32	Advance Programming Lab II	0	0	2	1
8	CA5PC03	Minor Project	0	0	4	2
		Total	**18**	**0**	**8**	**22**
		Total Contact Hours	**26**			

Electives:

CA5EL50	Cloud Computing
CA5EL06	Mobile Communications
CA5EL12	Cyber Security
CA5EL13	Cloud Security
CA5EL52	Machine Learning
CA5EL08	Software Project Management
CA5EL28	Network Security
CA5EL53	Internet of Things
CA5EL27	Mobile Application Development

Open Elective II:

OE00046	Software Testing

Department of Computer Applications

Choice Based Credit System Scheme- MCA

Batch 2023-2025

Second Year - Semester IV (Even Sem)

SEMESTER – IV Scheme						
S.N.	**Course Code**	**Courses**	**L**	**T**	**P**	**Credit**
1	CA5PC04	Major Project	0	0	24	12
		Total	**0**	**0**	**24**	**12**

Department of Computer Applications

Choice Based Credit System Scheme- MCA

Batch 2023-2025

First Year - Semester I (Odd Sem)

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CA5BS04	Mathematics of Computer Applications	4	0	0	4
2	CA5CO33	Advanced C Programming	4	0	0	4
3	CA5CO34	Data Structures and Algorithm	4	0	0	4
4	CA5CO35	Modern Operating System	4	0	0	4
5	CA5CO38	Advanced Database Management System	3	0	0	3
6	CA5CO23	Programming Lab I	0	0	2	1
7	CA5CO24	Database Lab	0	0	2	1
8	CA5CO10	Data Structures Lab	0	0	4	2
9	CA5MC02	Technical Communication and Soft Skills	2	0	0	0
		Total	21	0	8	**23**

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5BS04	Mathematics of Computer Application	4	0	0	4

Course Learning Objectives (CLOs):

- **CLO_{01}** To understand the concepts of sets and functions and to distinguish different types of functions and identify & describe various types of relations and their graphs.
- **CLO_{02}** To understand Boolean algebra and its applications to Computer Sciences including Mathematical Logic and to describe Lattices and Posets and their uses.
- **CLO_{03}** Equip the students with the knowledge of group theory and its application in computer science as coding theory.
- **CLO_{04}** To study the concepts of various graphs and apply Graph theory and trees in Computer Science and formulate computational problems.
- **CLO_{05}** To develop the ability to solve the recurrence relations by using various methods.

Unit- I:
Methods of Proof and Combinatorics: Methods of Proof-Direct Proofs, Indirect Proofs, Mathematical Induction, Method of Contradiction. Combinatorics: Permutations and Combinations, Pigeon Hole Principle and simple applications .

Unit – II
Graph Theory-I: Basic definitions of Graphs, Isomorphism, Walk, Path, Circuit, connectivity of a graph, cut points, cycles, Hamiltonian graphs, sub graphs, spanning sub graphs, isomorphic graphs, Digraphs(basic definitions of digraphs), Matrix Representation of Graphs (Adjacency, Incidence Matrices and Circuit Matrix).

Unit - III
Graph Theory-II : Weighted graph, Shortest Path in a weighted graph: Dijkstra's Algorithm, Tree, Properties of Tree, Binary Tree, Fundamental Circuit, Minimal Spanning Tree: Kruskal's Algorithm, Prim's Algorithm.

Unit – IV
Group Theory: Definition and basic properties of group, Order of an element of a group, Abelian groups, Subgroups, Algebra of subgroups, Cyclic groups and their simple properties, Coset decomposition and related theorems, Lagrange's theorem and its consequences.

Unit- V
Recurrence relation and generating function: Introduction to Recurrence relation and Recursive algorithms, Linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating function.

Text Books:
1. C. L. Liu; Elements of Discrete Mathematics, Tata McGraw-Hill Edition.
2. Kenneth H. Rosen; Discrete Mathematics and Its Applications, Tata McGraw-Hill Edition.
3. Eric Lehman , Tom Leighton; Mathematics for Computer Science , MIT .

Reference Books:

1. Narsingh Deo; Graph Theory with Applications to Engineering and Computer Science.
2. J.P. Tremblay and R. Manohar; Discrete Mathematical Structures with Applications to Computer Science, Tata Mc-Graw-Hill .

Web Source:

1. nptel.ac.in/courses/111106050
2.nptel.ac.in/courses/106106094/32

Open Learning Source:

1. https://swayam.gov.in/courses/public
2. http://nptel.ac.in/course.php

List of Practicals:

Not Applicable.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand the fundamental knowledge of theorem proving techniques.

CO_{02} Use various types of graphs for solving complex problems.

CO_{03} Apply their knowledge in solving problems of group theory.

CO_{04} Students will get exposed to group theory.

CO_{05} Analyze the strong background of recurrence relation and generating function which has diverse applications in the areas of computer science.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5CO33	Advanced C Programming	4	0	0	4

Course Learning Objectives (CLOs):

CLO_{01} To obtain in depth knowledge of C Language.
CLO_{02} To understand advanced features of C Programming Language.
CLO_{03} Designing of any software according to users requirements.

Unit- I: Function, Recursion, and Strings
Functions basics, application of functions. Recursion and its types, comparison of recursion and loops. Declaring and initializing strings, different ways of string I/O, operations on strings using user defined and in-built Functions, array of strings.

Unit-II: Pointers
What are pointers and its applications?, pointer variables, pointer operators, pointer and arrays, pointer to pointer, call by value and call by reference, array of pointers, pointer to an array, pass array to a function, pointers and strings, array of pointers to strings and its limitations, passing strings to functions, pointers to functions and its uses, array of function pointers, function returning pointers, dynamic memory allocation.

Unit- III: Aggregate Data Types
Structures-declaring and initializing, array of structure, array within structures, structures within structures, structure pointer, passing structure to functions, uses of structures. Unions, union of structures, structure within union, union within Structure. Enum, enum within structure.

UNIT-IV: Files and Preprocessor Directives
Application of file handling, file operations, text and binary files, file modes, file functions, small application of database management. C preprocessor directives, execution steps of C program, creating and implementing user defined header files.

Unit-V: Advance Topics
Typedef, command line arguments, variable number of arguments, self-referential structures, Career opportunities for C programming.

Text Books:
1. Kernighan & Ritchie "The C programming language", PHI
2. Schildt "C:The Complete reference" TMH.
3. Kanetkar Y. "Let us C", BPB.
4. Kanetkar Y.: "Pointers in C" , BPB

Problem and Assignments Book:
1. Kanetkar Y. "Let us C", BPB.

Reference Books:
1. Stephen Parata "C Primer Plus"
2. Paul Deitel and Harvey Deitel "C How to Program".

Web Resources
- http://www.learn-c.org/
- https://www.dyclassroom.com/

- https://www.tutorialspoint.com/cprogramming/index.htm
- https://fresh2refresh.com/c-programming/
- https://www.studytonight.com/c/

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand the basics of functions, recursion, strings, pointers, aggregate data type, file handling, and preprocessor directives.

CO_{02} Recognize advanced programming concepts.

CO_{03} Apply the knowledge of programming to solve complex problems.

CO_{04} Evaluate the concepts of C programming.

CO_{05} Create C programs that demonstrate a clear understanding of programming concepts

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5CO34	Data Structure and Algorithm	4	0	0	4

Course Learning Objectives(CLOs):

CLO_{01} To impart the basic concepts of data structures.
CLO_{02} To understand concepts about searching and sorting techniques
CLO_{03} To understand basic concepts about stack, queues, lists, trees and graphs

Unit- I:
Stacks: Contiguous implementation of stack, Operations on Stack, Array and linked representations of stacks, stack applications-infix to postfix conversion, postfix expression evaluation, recursion implementation.

Unit-II:
Queue: Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue; linked implementation of stack and queue- operations

Unit- III:
List: Singly linked list implementation, insertion, deletion and searching operations on linear list, circular linked list implementation, Doubly linked list implementation, insertion, deletion and searching operations. Applications of linked lists.

UNIT-IV:
Searching and Sorting: Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, shell sort, radix sort.
Searching: Linear and binary search methods, comparison of sorting and searching methods

Unit-V
Tree: definitions-height, depth, order, degree, parent and child relationship etc; Binary Trees, Tree traversals, expression tree- evaluation; linked representation of binary tree-operations.
Graphs: related definitions: graph representations- adjacency matrix, adjacency lists, adjacency multi list; traversal schemes- depth first search, breadth first search; Minimum spanning tree; shortest path algorithm; Kruskals & Dijkstras algorithm.

Text Books:

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. Data Structures and Algorithms
2. Tenebaum, Langsam & Augenstein, Data Structures Using C, Pearson

Reference Books:

1. Horowitz and Sahani, Fundamentals of data Structures, University Press
2. Trembley and Sorenson, Data Structures, TMH Publications
3. Venkatesan, Rose, Data Structures, Wiley India Pvt. Ltd

Web Resources

1. https://www.studytonight.com/data-structures/introduction-to-data-structures
2. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.htm
3. https://www.javatpoint.com/data-structure-tutorial
4. toolsqa.com/data-structures/
5. https://www.hackerearth.com/practice/data-structures/arrays/1-d/tutorial/

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Recall the basic concept of Array.
CO_{02} Describe stack, queue, linked list, and Graph Concepts.
CO_{03} Apply the concept of Stack, Queue, Link list, Tree, and Graph for solving complex problems
CO_{04} Examine the techniques of searching & sorting.
CO_{05} Compare Stack & Queue, Tree & Graph.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5CO35	Modern Operating System	4	0	0	4

Course Learning Objectives(CLOs)

- **CLO_{01}** To know purpose, structure and functions of operating systems
- **CLO_{02}** To study various process scheduling algorithms
- **CLO_{03}** To know process synchronization
- **CLO_{04}** To provide hardware and software issues in modern distributed systems

Unit-I

Introduction to Operating Systems: Operating Systems Overview- Overview and Functions of operating systems, protection and security, distributed systems, operating systems structures, services, system calls and their working. History and generation of operating system.

Unit-II

Process and Threads: Process concepts, threads, scheduling-criteria, algorithms, and their evaluation. Process Scheduling; Thread scheduling, case studies UNIX. Linux. Windows

Unit-III

Concurrency Control (IPC):Process synchronization, critical- section problem. classic problems of synchronization, Software Solutions for synchronization problem. Hardware Solutions for synchronization problem. Synchronization and their applications. Understanding of Semaphore – Mutex – Monitor – Event Counters

Unit-IV

Advanced Operating Systems: Distributed Operating system: architecture, Design issues, Distributed mutual exclusion, distributed deadlock detection, shared memory, Distributed scheduling. Multiprocessor operating systems: architecture, operating system design issues, threads, process synchronization, process scheduling, memory management, reliability and fault tolerance.

Unit-V

Distributed Resource Management: Distributed File systems, Architecture, Mechanisms, Design Issues, Distributed Shared Memory, Architecture, Algorithm, Protocols – Design Issues. Distributed Scheduling, Issues, Components, Algorithms.

Text Books

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne -Operating System Concepts
2. Andrew S Tanenbaum, PHI, Modern Operating Systems.
3. D. M. Dhamdhere. TMH ,Operating systems- A Concept based Approach

Reference Books

1. Stallings, Pearson education, Operating Systems - Internals and Design Principles.
2. B. L. Stuart. Cengage learning, India Edition, Principles of Operating Systems
3. Mukesh Singhal and N. G. Shivaratri, McGraw Hill Advanced Concepts in Operating Systems.
4. A. S. Godbole, TMH, Operating Systems.

Web Resources:

- http://williamstallings.com/OS/Animation/Animations.html
- http://nptel.ac.in/courses/106106144/
- http://nptel.ac.in/courses/106108101/
- http://codex.cs.yale.edu/avi/os-book/OS9/slide-dir

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Understand the basic concept of operating systems, Distributed operating system, CPU scheduling, Inter-process Communication, Semaphore – Mutex – Monitor – Event Counters.
CO_{02}	Understand the architecture and design issues of Distributed Operating Systems.
CO_{03}	Analyze the case study of UNIX, LINUX, and Windows.
CO_{04}	Comparing different deadlock detection algorithms.
CO_{05}	Explain the theory of: processes, threads, resource control and scheduling.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5CO38	Advanced Database Management System	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand the basic concepts and terminology related to DBMS and Relational Database Design

CLO_{02} To the design and implement Parallel and Distributed Databases.

CLO_{03} To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports.

Unit- I:

Database Concepts: File System v/s Database System, Users of Database System, Data Independence, DBMS system architecture

Entity-Relationship (ER) Model: Entity Types, Entity Sets, Attributes & Keys, Relationships, Roles and Structural Constraints, E-R Diagrams, Reduction of an E-R Diagram to Tables Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation.

Unit-II:

Normalization: The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Anomalies, Functional Dependencies, Characteristics of Functional Dependencies, The Process of Normalization, First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce—Codd Normal Form (BCNF), Fourth Normal Form (4NF), Multi-Valued Dependency, Fifth Normal Form (5NF), Lossless-Join Dependency.

Unit-III:

Transactions and Concurrency Control : Basic concept; ACID properties; transaction state; implementation of atomicity and durability; concurrent executions; basic idea of serializability; view and conflict serializability Recovery Techniques Failure Classification, Storage Structure, Recovery and Atomicity Log Based Recovery; deferred database modification, immediate database modification, checkpoints.

UNIT-IV:

Parallel and Distributed Databases: Architectures for Parallel Databases, Parallel Query Evaluation, Parallelizing Individual Operations, Bulk Loading and Scanning, Sorting, Joins.

Distributed Databases: Types of Distributed Databases, Distributed DBMS Architectures, Client-Server Systems, Collaborating Server Systems, Middleware Systems, Storing Data in a Distributed DBMS, Fragmentation, Replication.

Unit-V

Object Relational Database Systems: Introduction, Database Design for an ORDBMS, New Challenges in Implementing an ORDBMS, OODBMS, Comparing RDBMS with OODBMS and ORDBMS.

Enhanced Data Models for Advanced Applications: An overview of Active Databases, Temporal database, Spatial Databases, Deductive Databases, Mobile Database, Multimedia Databases.

Database Design Case Study: Online Retail Shopping, Airline Reservation System etc.

Text Books:

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill.
2. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, McGraw Hill.
3. R Elmarsi, & S B Navathe, Fundamental of Database System, Pearson Education.

Reference Books:

1. F. R. Mcfadden, J. Hoffer and M. Prescott, Modern Database Management, Addison Wesley.
2. B.C. Desai, An introduction to Database Systems, BPB.
3. Raghurama Krishnan, Database Systems, TMH.

Web Resources

Not Applicable.

List of Practical

Not Applicable.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand the basic principles of database management systems and ER Models.

CO_{02} Apply various normalization techniques for removing data redundancy.

CO_{03} Analyze transaction processing and concurrency control concepts.

CO_{04} Understand the basics of parallel and distributed databases..

CO_{05} Assess the basics of Object relational databases and enhanced data models.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5CO24	Database Lab	0	0	2	1

Course Learning Objectives (CLOs):

Not Applicable

List of Practical

Lab Assignment – 1 SQL

The following tables form part of a database held in a relational DBMS:
Hotel (hotelNo, hotelName, city)
Room (roomNo, hotelNo, type, price)
Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)
Guest (guestNo, guestName, guestAddress)
Where **Hotel** contains hotel details and hotelNo is the primary key;
Room contains room detals for each hotel and (roomNo, hotelNo) forms the primary key;
Booking contains details of bookings and (hotelNo, guestNo, dateFrom) forms the primary key;
Guest contains guest details and guestNo is the primary key.

Simple Queries

1. List full details of all hotels.
2. List full details of all hotels in London.
3. List the names and addresses of all guest living in London, alphabetically ordered by name.
4. List all double or family rooms with a price below $40.00 per night, in ascending order of price.
5. List the names for which no dateTo has been specified.
6. List all single rooms with a price below $40.00 per night.
7. List the name and cities of all guests.
8. List the price and type of all rooms at the Grosvenor Hotel.
9. List the guests currently staying at the Grosvenor Hotel.
10. List the details of all rooms at the Grosvenor Hotel, including the names of the guest staying in the room, if the room is occupied.
11. List the guest details (guestNo, guestName, and guestAddress) of all guests staying at the Grosvenor Hotel.

Grouping

1. List the number of rooms in each hotel.
2. List the number of rooms in each hotel in London.
3. What is the average number of bookings for each hotel in August?
4. What is the most commonly booked room type for each hotel in London?

What is the lost income from unoccupied rooms at each hotel today?

Lab Assignment – 2 SQL

The following tables form part of a database held in a relational DBMS:

```
S     ( S#, SNAME, STATUS, CITY )
      PRIMARY KEY ( S# )
P     ( P#, PNAME, COLOR, WEIGHT, CITY )
      PRIMARY KEY ( P# )
J     ( J#, JNAME, CITY )
      PRIMARY KEY ( J# )
SPJ   ( S#, P#, J#, QTY )
      PRIMARY KEY ( S#, P#, J# )
      FOREIGN KEY ( S# ) REFERENCES S
      FOREIGN KEY ( P# ) REFERENCES P
      FOREIGN KEY ( J# ) REFERENCES J
```

S

S#	SNAME	STATUS	CITY
S1	Smith	20	London
S2	Jones	10	Paris
S3	Blake	30	Paris
S4	Clark	20	London
S5	Adams	30	Athens

P

P#	PNAME	COLOR	WEIGHT	CITY
P1	Nut	Red	12.0	London
P2	Bolt	Green	17.0	Paris
P3	Screw	Blue	17.0	Oslo
P4	Screw	Red	14.0	London
P5	Cam	Blue	12.0	Paris
P6	Cog	Red	19.0	London

J

J#	JNAME	CITY
J1	Sorter	Paris
J2	Display	Rome
J3	OCR	Athens
J4	Console	Athens
J5	RAID	London
J6	EDS	Oslo
J7	Tape	London

SPJ

S#	P#	J#	QTY
S1	P1	J1	200
S1	P1	J4	700
S2	P3	J1	400
S2	P3	J2	200
S2	P3	J3	200
S2	P3	J4	500
S2	P3	J5	600
S2	P3	J6	400
S2	P3	J7	800
S2	P5	J2	100
S3	P3	J1	200
S3	P4	J2	500
S4	P6	J3	300
S4	P6	J7	300
S5	P2	J2	200
S5	P2	J4	100
S5	P5	J5	500
S5	P5	J7	100
S5	P6	J2	200
S5	P1	J4	100
S5	P3	J4	200
S5	P4	J4	800
S5	P5	J4	400
S5	P6	J4	500

Figure: The supplier-parts-project database (Sample Values)

Write SQL Queries for the above database:

1. Get Full details of all projects.
2. Get Full details of all projects in London.
3. Get supplier numbers for suppliers who supply projects J1.
4. Get all shipments where the quantity is in the range 300 to 750 inclusive.
5. Get all part-color/part-city pairs. Note : Here and subsequently, the terms “all” means “all currently represented in the database, “ not “all possible”.
6. Get all supplier -number/part- number/project- number triples such that the indicated supplier, part and project are all collocated (i.e. all in the same city).
7. Get all supplier -number/part- number/project- number triples such that the indicated supplier, part and project are not all collocated.
8. Get all supplier -number/part- number/project- number triples such that no two of the indicated supplier, part and project are collocated.
9. Get full details for parts supplied by the supplier in the London.
10. Get part numbers for parts supplied by a supplier in London to a project in London.

11 Get all pairs of city names such that a supplier in the first city supplies a project in the second city.
12 Get part numbers for parts supplied to any project by a supplier in the same city as that project.
13 Get project numbers for projects supplied by at least one supplier not in the same city.
14 Get all pairs of part numbers such that some supplier supplies both the indicated parts.
15 Get the total number of projects supplied by supplier S1.
16 Get the total quantity of part P1 supplied by supplier S1.
17 For each part being supplied to a project, get the part number, the project number, and the corresponding total quantity.
18 Get part numbers of parts supplied to some project in an average quantity of more than 350.
19 Get project names for projects supplied by supplier S1.
20 Get colors of parts supplied by supplier S1.
21 Get part numbers for parts supplied to any project in London.
22 Get project numbers for projects using at least one part available from supplier S1.
23 Get supplier numbers for suppliers supplying at least one part supplied by at least one supplier who supplies at least one red part.
24 Get supplier numbers for suppliers with a status lower than that of supplier S1.
25 Get project numbers for projects whose city is first in the alphabetic list of such cities
26 Get project numbers for projects supplied with part P1 in an average quantity greater than the greatest quantity in which any part is supplied to project J1
27 Get supplier numbers for suppliers supplying some project with part P1 in a quantity greater than the average shipment quantity of part P1 for that project.
28 Get project numbers for project not supplied with any red part by any London supplier.
29 Get project numbers for projects supplied entirely by supplier SI.
30 Get part numbers for parts supplied to all projects in London.
31 Get supplier numbers for suppliers who supply the same part to all projects.
32 Get project numbers for projects supplied with at least all parts available from supplier SI.
33 Get all cities in which at least one supplier. Part. Or project is located.
34 Get part numbers for parts that are supplied either by London supplier or to a London project.
35 Get supplier-number/part-number pairs such that the indicated supplier does not supply the indicated part.
36 Get all pairs of supplier numbers, Sx and Sy say. Such that Sx and Sy supply exactly the same set of parts each. Note: For simplicity, you might want to use the original suppliers-and-part data-base for this exercise, instead of the expanded suppliers-partprojects database.
37. Get a “grouped” version of all shipment showing, for each suppliers-number/partnumber pair, the corresponding project numbers and quantities in the form of a binary relation.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand how to transform an information model into a relational database schema and use a data definition language and/or utilities to implement the schema using a DBMS.

CO_{02} Determine how to use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.

CO_{03} Illustrate the methods to develop applications using basic and modern database techniques as per organization requirements.

CO_{04} Study how to test various database techniques in developing data-intensive applications.

CO_{05} Simulate various database systems using available tools.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO23	Programming Lab I	0	0	2	2	1

List of Practical

Programs on functions

1. Find factorial of a number using function
2. Find a number is prime or not using function
3. Find the sum of series $1+x+x^2/2! +x^3/3!+\ldots+x^n/n!$ Use functions to calculate power and factorial
4. Find the sum of series $x-x^3/3!+x^5/5!$ … Use functions to calculate power and factorial

Programs on strings.

1. Find length of a string using in-built function and using user defined function
2. Copy one string to another using in-built function and using user defined function
3. Concat two strings using in-built function and using user defined function
4. Reverse a string using in-built function and using user defined function
5. Find a name is present in a set of strings or not.

Programs on pointers

1. Add two numbers using pointer
2. Access elements of One –dimension and two-dimension array using pointers
3. Swap two numbers using call by reference
4. Find largest number in a array using dynamic memory allocation
5. Swap two names in a set of strings using array of pointers to strings.
6. Call a function using function pointer
7. Find addition, subtraction, multiplication and division of two numbers using array of function pointers.

Programs on structure

1. Create a structure to specify data on students given below: Roll number, Name, Department, Course, Year of joining. Assume that there are not morethan 450 students in the college.

a. Write a function to print names of all students who joined in Particularyear.
b. Write a function to print the data of a student whose roll number isgiven.
c. Write a function to sort data of a student in alphabetical order ofnames.

2. Create a structure to specify data of customers in a bank. The data to be storedis: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank.

a. Write a function to print the Account number and name of eachcustomerwith balance below Rs.100.
b. If a customer request for withdrawal or deposit, it is given in theform: Acct.no, amount, code (1 for deposit, 0 for withdrawal)
c. Write a program to give a message, "The balance is insufficient for the specifiedwithdrawal".

Programs on File Handling

1. Read and write character by character in a text file.
2. Write a program to copy one file to another. While doing so replace alllowercase characters to their equivalent uppercase characters.
3. Add content of one file at the end of another Suppose a file contains student's records with each record containing name and age of a student. Write aprogram to read these records and display them in sorted order by name.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand the basics of functions, recursion, strings, pointers, aggregate data type, file handling, and pre- processor directives.

CO_{02} Recognize advanced programming concepts.
CO_{03} Apply the knowledge of programming to solve complex problems.
CO_{04} Evaluate the concepts of C programming.
CO_{05} Create C programs that demonstrate a clear understanding of programming concepts.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO10	Data Structures Lab	0	0	4	4	2

List of Practical

1. Find sum of elements of an array and reverse an array
2. Search an element using Linear search and Binary Search
3. Insert and remove an element from an array
4. Copy one array to another.
5. Addition, subtraction and multiplication of two matrices
6. Find factorial of a number using function
7. Find a number is prime or not using function
8. Find the sum of series
   $1+x+x^2/2! +x^3/3!+\ldots+x^n/n!$ using function
9. Use functions to calculate power and factorial
10. Find the sum of series

$x-x^3/3!+x^5/5! \ldots$ using function

11. Find factorial of a number using recursion
12. Find a to the power b using recursion
13. Print fibonacci series using recursion
14. Sum of digits of a number using recursion
15. Add two numbers using pointer
16. Access elements of One –dimension and two-dimension array using pointers
17. Find largest number in a array using dynamic memory allocation
18. Swap two names in a set of strings using array of pointers to strings.
19. Write a program for push and pop on Stack using array
20. Write a program for insert and delete on Queue using array
21. Write a program for insert and delete on Circular Queue using array
22. Write a program for insert and delete on Dequeue Queue using array
23. Write a program for insert and delete on priority queue using array
24. Write a Menu-Driven program for following on singly link – list
    a. Insert a node at end
    b. Insert a node at beginning
    c. Insert a node at some location
    d. Delete a node at end
    e. Delete a node at beginning
    f. Delete a node from a position

g. Searching

h. Display

25. Write program no. 24 for circular link list, doubly link list, doubly circular link list.
26. Write a program for push and pop on Stack using link list
27. Write a program for insert and delete on Queue using link list
28. Write a program for binary tree operations -Addition new nodes into the tree, Deletion nodes from the tree, Searching a node and Display
29. Write a program for Sequential Search
30. Write a program for Binary Search
31. Write a program for Bubble Sort
32. Write a program for Selection Sort
33. Write a program for Insertion Sort
34. Write a program for Shell Sort
35. Write a program for Merge Sort
36. Write a program for Quick Sort
37. Write a program for Radix Sort

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Recall the basic concept of Array.
CO_{02}	Describe stack, queue, linked list, tree and Graph Concepts.
CO_{03}	Apply the concept of Stack, Queue, Linked list, Tree, and Graph in real-life computer science applications
CO_{04}	Examine the techniques of searching & sorting.
CO_{05}	Compare Stack & Queue, Tree & Graph

Course Code	Course Name	Hours per Week			Total	Total
		L	**T**	**P**	**Hrs.**	Credits
CA5MC02	Technical Communication and Soft Skills	2	0	0	2	0

Unit-I

Developing effective communication skills; Process, characteristics and principles, channels, verbal and non-verbal types, barriers to effective communication, importance of effective communication, Importance of Feedback in communication

Unit-II

Listening Skills Listening: meaning, process, difference between hearing and listening, types, barriers, importance. Developing Listening Skills

Unit-III

Developing speaking skills: Oral Presentation –Delivery using Audio – Visual Aids with stress on body language and voice modulations. (Topics to be selected by the Instructor for presentations), speeches, extempore, JAM, Interview skills, Group discussion skills.

Unit-IV

Developing Writing Skills and Business Correspondence - Business Letters, Parts & Layouts of Business Letters, Writing job application and Resume, Calling/ Sending Quotations/ Orders/ Complaints and E-mails

Unit-V

Report writing- types of reports, format, Presenting Diagrams/Graphs/Charts/Tables, Searching, Organizing, Presenting, Submitting. Technical description, Writing abstracts/Summary/Synopsis,

Text Books:

1. Rai U S, Rai SM. Effective Communication. Himalaya Publishing House.
2. Korlahalli J.S. ,Rajendra Pal. Essentials of Business Communication All Courses.Sultan Chand & Sons
3. Krishna Mohan, Sharma R C. Business Correspondence and Report Writing. Mc Graw Hill Education, New Delhi. Fourth Edition.

Reference Books:

1. Thompson A.J, A. V. Martinet. A Practical English Grammar. Oxford UP. New Delhi.
2. Kumar Sanjay, PushpaLata. English for Effective Communication. Oxford UP. New Delhi.
3. Kumar Sanjay, PushpaLata Communication Skills. Oxford UP. New Delhi. II Edition

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Understand various channels of communication.
CO_{02}	Develop listening skills by understanding types and avoiding barriers
CO_{03}	Analyze their own presentation skills and improve it.
CO_{04}	Write letters and emails in proper formats
CO_{05}	Presenting ideas in the written format systematically in the form of reports.

Medi-Caps University, Indore
Computer Applications
Model Scheme for Batch 2023-25

First Year - Semester II (Even Sem)

SEMESTER II						
S.N.	**Course Code**	**Courses**	**L**	**T**	**P**	**Credit**
1	CA5CO25	Software Engineering Principles	3	0	0	3
2	CA5CO26	Computer Networks Fundamental	3	0	0	3
3	Elective - I	Elective - I	3	0	0	3
4	Elective - II	Elective - II	3	0	0	3
5	CA5EL49	Theory of Computation	4	0	0	4
6	Open Elective - I	Open Elective - I	3	0	0	3
7	CA5CO27	Programming Lab II	0	0	2	1
8	CA5CO28	Advance Programming Lab I	0	0	4	2
9	CA5CO29	Computer Networks Lab	0	0	2	1
10	CA5MC04	Personality Development & Quantitative Aptitude	3	0	0	0
		Total	**22**			**23**
		Total Contact Hours	**30**			

Electives

CA5EL54	Programming in Python
CA5EL01	Object Oriented Programming Paradigm
CA5EL04	Artificial Intelligence
CA5EL05	Design and Analysis of Algorithms
CA5EL21	Information Storage and Management

Open Elective - I

OE00082	Advanced Object Oriented Programming

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5CO25	Software Engineering Principles	3	0	0	3

Course Learning Objectives (CLOs):

- **CLO_{01}** Students will be able to understand software development approaches using software engineering principles.
- **CLO_{02}** Students will become well conversant with Software engineering methodology.
- **CLO_{03}** They will be more skilled in software development and using development tools.
- **CLO_{04}** Students will be able to develop complete software by using SDLC phases.
- **CLO_{05}** Students will be able to know the latest trends in software engineering.

Unit- I:
Introduction: Definition of Software Engineering, Software Crisis, principles of Abstraction and Decomposition, Types of Software Projects, Emergence of Software Engineering Techniques, Evolution of other Software Engineering Techniques. Life Cycle Models: Software Life Cycle, Waterfall, Iterative Waterfall Model, Prototyping, Incremental Model, Evolutionary, RAD Model, Spiral model.

Unit-II
Agile models: Agile Manifesto, Principal Techniques of Agile, Extreme Programming Model, Scrum, Scrum Framework. Requirements analysis and specification: Activities in Requirements Analysis and Specification: Gathering, Analysis, Specification. SRS Document, Component of SRS Document, overview of IEEE Standard for SRS.

Unit-III
Software design: Definition of Software Design, Module, Stages in Design, Modularity, Cohesion and Coupling. Design Approaches: overview of Function-Oriented and Object-Oriented Design. Structured Analysis and Design: Functional Decomposition, Structured Analysis: Data Flow Diagram, Data Dictionary. Structured Design: Structure Chart.

Unit-IV
Object-oriented concepts: Diagrams and views in UML, Use Case Modelling, Factoring Use Cases, Use Case Description, Class Diagram, Sequence Diagram, State Machine Diagrams. Object-oriented analysis and design: Domain Modelling: Boundary objects, Entity objects, Controller objects.

Unit-V
Software Testing: Errors, Faults, Failures, Verification and Validation, Testing Levels: Unit testing, Integration testing, System testing, Regression testing. Pesticide Effect. Basic Concepts in Testing: Test Cases, Test data, Test Suites, Negative Test Cases, Design of Test Cases, Test Plan. Unit Testing: Black-Box Testing: Equivalence class partitioning, Boundary value testing, White-box Testing: coverage based testing, fault based testing.

Text Books:
1. Software Engineering, Rajib Mall, PHI
2. Software Engineering – A Practitioner's Approach, Roger S Pressman, Tata McGraw Hill Education.
3. Software Engineering, Ian Somerville, 9th edition, Pearson Education.
4. Software Design Methodology, Hong Zhu, Elsevier
5. An Integrated Approach to Software Engineering, Pankaj Jalote, Narosa Publication.

Reference Books:
1. Software Engineering- Theory and Practice, S L Pfleeger, Pearson.

2. Distilled UML , Martin Fowler, Addison-Wesley
3. Software Engineering Principles and Practice, Hans Van Vliet, Wiley
4. Software Engineering Concepts, Richard Fairley, Tata McGraw Hill Education.
5. Software Engineering: Concepts and Practices, Ugrasen Suman, Cengage Learning.

Web Source:

1. https://www.tutorialspoint.com/software_engineering/
2. https://www.agilealliance.org/agile101/
3. http://www.softwaretestinghelp.com/
4. https://www.coursera.org/courses?languages=en&query=software+engineering
5. https://swayam.gov.in/nd1_noc19_cs69/preview

List of Practicals:

Not Applicable.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Understand the need for software engineering, software life cycle, and software testing
CO_{02}	Understand the activities in each phase of the Software Development Life cycle.
CO_{03}	Apply different SDLC models in different situations, structured and object-oriented analysis and design during software design, and different testing techniques at different levels.
CO_{04}	Analyze traditional and agile software process models and compare Structured Analysis/Structured Design with OOAD.
CO_{05}	Evaluate Object-Oriented concepts and its design techniques.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5CO26	Computer Networks Fundamentals	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To provide students with an overview of the concepts and fundamentals of data Communication and computer networks.

CLO_{02} To familiarize with the basic taxonomy and terminology of computer networking area.

CLO_{03} To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite

CLO_{04} Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

CLO_{05} Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Unit-I

Overview of data communication, Introduction to computer networks: network criteria and application, protocol and standards, line configuration, topologies, categories of networks. Concepts of layering and layered model, OSI reference model, TCP/IP reference model, their Comparative study, Physical Layer, Introduction to physical layer-data and signal, digital data Transmission, parallel and serial transmission and transmission impairments, channel Capacity, performance metrics of networks, Overview of bandwidth utilization: multiplexing Schemes, concepts of switching: Circuit switching, Packet switching message switching and Packet switching.

Unit-II

The Data Link Layer: Error detection techniques: Parity check, Vertical and longitudinal Redundancy check, CRC code and checksum. Data link layer issues-Point to point and multipoint links, flow control, sliding window protocol, various ARQ techniques for error and flow control and their comparison, Multiple access protocols- pure and slotted ALOHA, CSMA, CSMA/CD, CSMA/CA.

Unit-III

Wired and wireless networks: A brief survey of IEEE LAN standards. Comparative study of Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, IEEE802.11, ISDN, ATM network- ATM architecture, ATM layers.

Unit-IV

The Network Layer: Duties of network layer, Design Issues, Concept of Internetworking & Devices- Repeaters, Hubs, Bridges, Switches, Router, and Gateway. Routing algorithms- shortest path algorithm, flooding, distance vector routing, link state routing. Internet addressing- IP addressing scheme, IPv4 protocol, IPv6 protocol.

Unit-V

The Transport Layer Duties of transport layer, Design issues and services, Congestion control algorithm- Leaky bucket algorithm, Token bucket algorithm, Quality of service-techniques to improve user datagram protocol and transmission control protocol. Application Layer: Application Layer Design Issues, Domain Name System - Electronic Mail, WWW.

Text Books:

1. Computer Network , A. S. Tanenbaum, Pearson Education

2. Data Communications and Networking, B. A. Forouzan, TMH
3. Computer Networks : Principles, Technologies & Protocols for Network Design, Natalia Olifer & Victor Olifer, Wiley India
4. Computer Networking, James F. Kurose , Keith W. Ross, Pearson.

Reference Books:

1. Internetworking with TCP/IP, D. E. Comer, PHI
2. Computer Communication Networks, Stallings W., PHI.
3. Data & Network Communication, Michael A. Miller, Vikas Publication. 4. Computer Communications and Networking
5. Technologies, M. A. Gallo and W. M. Hancock, Cengage Learning (Indian Edition).

Web Source:

1. https://www.cs.vu.nl.
2. https://onlinecourses.nptel.ac.in
3. https://www.youtube.com/user/nptelhrd

List of Practicals:

Not Applicable.

Course Outcomes (COs):

After completion of this course the students shall be able to:

- **CO_{01}** Understand the importance of data communications and networking.
- **CO_{02}** Explain how communication works in data networks and the Internet with the help of layered architecture.
- **CO_{03}** Recognize the different inter-networking devices and their functionalities.
- **CO_{04}** Analyze the services and features of various layers of data networks.
- **CO_{05}** Evaluate the features and operations of various protocols such as HTTP, DNS, SMTP, TCP, UDP, and IP.
- **CO_{06}** Compare between various wired and wireless network architecture and services.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5EL54	Programming in Python	3	0	0	3

Course Learning Objectives (CLOs):

- **CLO_{01}** An ability to the Python environment, data types, operators used in Python.
- **CLO_{02}** To introduce Python programming language through its core language basics and program design techniques suitable for modern applications.
- **CLO_{03}** To understand the wide range of programming facilities available in Python covering special methods, Sets and Dictionaries.
- **CLO_{04}** To write well designed and well documented programs that is easily maintainable.
- **CLO_{05}** To utilize high-performance programming constructs available in Python to develop solutions in real life scenarios.

Course Outcomes (COs):

Unit- I: Basic Introduction
Introduction to Python, History, Features, Installation, command interpreter and development environment-IDLE, Application of Python, Python 2/3 differences, Basic program structure, quotation and indentation, Operator, Basic data types and In-built o.

Unit-II: Function and Sequence
Functions- definition and use, Arguments, Block structure, scope, Recursion, Advanced Argument passing, Conditionals and Boolean expressions, Sequences: Strings, Tuples, Lists. Iteration, looping and control flow, String methods and formatting

Unit- III: OOPS concepts
Object Oriented concepts-Encapsulation, Polymorphism, Classes, Class instances, Constructors & Destructors_init_, _del_, Multiple inheritance, Operator overloading Properties, Special methods, Emulating built-in types

UNIT-IV: Mutable data types, Exception and Standard modules
Dictionaries, Sets and Mutability, Files and Text Processing, Exceptions, List and Dict Comprehensions, Lambda, Functions as Objects, Standard Modules-math, random Packages

Unit-V Advanced Methods, Modules and Packages
Iterators and Generators - special metods__iter__() and__next___(),Decorators, Closures Property, Context Managers, Context Decorator, Regular expression-re.match, re.search, re.findall.

Text Books:

1. Building Skills in Python-Steven F. Lott, 2010, itmaybeahack.com.
2. A Byte of Python, Swaroop C H., ebshelf Inc.

3. Programming Python, Mark Lutz , O Reily, 4th Edition, 2010
4. Python Training Guide – Mercury Learning & Information USA, BPB Publications, 2015
5. Mark Lutz,"Learning Python", O Reily, 4th Edition, 2009

Problem and Assignments Book:

1. Programming and Problem Solving with PYTHON-Ashok Namdev Kamthane ,First Edition, McGrawHill, 2017

Reference Books:

1. Python Programming for absolute Beginner- Michael Dawson, Third Edition, CEN-GAGE Learning, 2010
2. Mark Lutz,"Learning Python", O Reily, 4th Edition, 2009.

Web Resources

- https://www.tutorialspoint.com/python/index.htm
- https://www.programiz.com/python-programming

After completion of this course the students shall be able to:

CO_{01} Understand the key concepts of Python programming such as Python syntax, language constructs, variables, data types, operators, control structures, and functions.

CO_{02} Utilize Python's built-in data structures effectively, such as lists, tuples, sets, and dictionaries.

CO_{03} Apply the principles of object-oriented programming (OOP) in Python.

CO_{04} Illustrate Advanced Methods, Modules, and Packages in Python.

CO_{05} Experiments on file handling and exception handling in Python.

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Course Code	Course Name	Hours per Week			
		L	T	P	Credits
OE00082	Advanced Object Oriented Programming	3	0	0	3

Course Learning Objectives (CLOs):

CLO_{01} To understand fundamentals of Java Programming.
CLO_{02} To understand fundamentals of Object-Oriented Programming in Java.
CLO_{03} To understand GUI programming and database connectivity in Java
CLO_{04} Website development using Java according to user requirements.

Unit-I Java Basics
What is Java, Features of Java, First program in Java, Compilation and Execution, Data Types, Literals, Variables, Operators, Type Conversion and Casting, Control Statements, Arrays, Strings.

Unit-II Object Oriented Programming - I
Object Oriented Concepts of Java, Class Declaration, Declaring Objects, Access Specifiers, Constructor and its Types, finalize() Method, this Keyword, Method and Constructor Overloading.

Unit-III Object Oriented Programming – II
Inheritance, super, Uses of final Keyword, Method Overriding, Dynamic Method Dispatch, Abstract class, Interface, Packages, Object class, Type Wrapper Classes.

Unit-IV Swings
Java Swing Class Hierarchy**,** Graphical User Interface Elements, Containers, Layouts. The Java Event Handling Model: Event Handling Basics, Event Classes, Event Listeners, Event Adapters.
Database Connectivity in Swings: Program to Read, Insert, Update and Delete to the Database.

Unit-V JSP
What is JSP, Advantage of JSP, JSP Scripting Elements, JSP Implicit Objects, JSP Directives, JSP Action Tags, Invoking a JSP from JSP
JSP Application to Read, Insert, Update and Delete to the Database.

Text Books:
1. Schildt, JAVA: The Complete Reference, TMH.
2. Murach's, Java Servlets and JSP, Joel Murach, Murach publication.

Problem and Assignments Book:

Reference Books:
1. Kogent Solution Inc , Java 6 Programming Black Book, dreamTech Pub
2. Bryan Basham, Kathy Sierra & Bert Bates, Head First Servlets & JSP, O'Reilly
3. H. M.Deitel, P.J. Deitel, S.E. Santry, Advanced Java 2 Platform HOW TO PROGRAM, Prentice Hall.

Web Resources
1. http://www.learnjavaonline.org/
2. https://www.tutorialspoint.com/java/
3. https://www.programiz.com/java-programming
4. https://docs.oracle.com/javase/tutorial/

5. https://www.javatpoint.com/java-tutorial
6. http://nptel.ac.in/courses/106106147/
7. https://www.lynda.com/
8. https://alison.com/courses
9. https://www.edx.org/learn/java

List of Practical

NA

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Understand the concepts of basic Java programming, object-oriented Programming, GUI developments, and web applications in Java.
CO_{02}	Apply the concepts of object-oriented programming and Database connectivity in Java programs.
CO_{03}	Analyze the potential of Java language for creating Desktop Applications and web Applications.
CO_{04}	Create a desktop application in Java with database connectivity.
CO_{05}	Create a Web Application in Java

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5EL04	Artificial Intelligence	3	0	0	0

Course Learning Objectives (CLOs):

CLO$_{01}$ To have the basic knowledge of how to design and implement AI systems

CLO$_{02}$ To know how to use AI planning technology for projects in different application domains.

CLO$_{03}$ To study multidisciplinary requirements of problem solving.

CLO$_{04}$ To learn various types of algorithms useful in Artificial Intelligence (AI).

CLO$_{05}$ To convey the ideas in AI research and programming language related to emerging technology.

Unit-I Introduction

Introduction: Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, AI Technique, Applications of Artificial Intelligence. Introduction to LISP programming: Syntax and numeric functions, Basic list manipulation functions.

Unit-II . Introduction to Search

Introduction to Search: Searching for solutions, uniformed search strategies, informed search strategies, Local search algorithms. State space search: Production systems. Problem Characteristics, Heuristic search - Hill climbing, Steepest Ascent Hill Climbing, best first search, OR Graphs, A* Algorithm, Problem Reduction, AND-OR Graphs, Constraint Satisfaction Problems, Crypt arithmetic Problems.

Unit-III . Knowledge Representation

Knowledge Representation & Reasoning: Approaches to Knowledge Representation, Types of Knowledge, Propositional logic, Theory of first order logic, Inference in First Order Predicate Logic, Forward & Backward chaining. Horn's Clauses, Skolemization,, Semantic Networks, Scripts, Conceptual Dependency.

Unit-IV. Game playing and Planning

Game playing: Minimax search procedure, adding alpha, beta cut-offs, Secondary Search, Using Book Moves, Alternatives to Minimax.

Planning: Overview: An example domain - the block word, component of planning systems, goal stack planning, Non Linear Planning

Unit-V. Expert systems

Expert systems: Introduction to expert system and benefits and application of expert systems, Capabilities of expert systems, Components of expert systems, Limitations of Expert Systems, Expert system shells, knowledge acquisition. Need and justification for expert systems. Case studies: MYCIN, RI. Learning: Concept of learning, rote learning, learning by induction, explanation based learning.

Text Books:

1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-hill EducationP. Ltd.
2. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India.
3. Clocksin & C.S.Melish “Programming in PROLOG”, Narosa Publishing House.
4. Nils J. Nilson “Principles of Artifical Intelligence”, Narosa Publishing House.

Problem and Assignments Book:

Reference Books:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. E.Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
3. Sasikumar, M., Ramani, S., "Rule Based Expert System", Narosa Publishing House, 1994.
4. “Artifical Intelligence” 4 ed. Pearson.

Web Resources

List of Practical

NA

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Gain a historical perspective of AI and its foundations. Become familiar with LISP programming. To write simple to intermediate programs and an ability to understand code written.

CO_{02} Understand the strengths and limitations of various state-space search algorithms and choose the appropriate algorithms for a problem. Become familiar with the basic principles of AI toward problem-solving, inference, perception, knowledge representation, and learning.

CO_{03} Apply knowledge representation techniques and problem-solving strategies to common AI applications.

CO_{04} Analyze the basic proficiency in a traditional AI language including other topics such as minimax, resolution, game playing, planning, etc.

CO_{05} To have an understanding of the basic issues of knowledge representation, learning, and heuristic search, as well as an understanding of Expert systems.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5EL49	Theory of Computation	4	0	0	4

Course Learning Objectives (CLOs):

- **CLO_{01}** To understand the fundamentals of theoretical foundations of computer science to build computable abstract systems.
- **CLO_{02}** To understand the grammar and languages to build effective computable automata systems
- **CLO_{03}** To learn about the required grammar and eliminate ambiguity to develop optimized automata systems.
- **CLO_{04}** To learn about the hypothesis and computable functions of Turing machines.
- **CLO_{05}** To understand about computability, reducibility theory for P,NP and NP hard problem

Unit- I:
Introduction: Alphabets, Strings and Language. Kleene star, Kleene plus.
Finite Automata and Regular Expressions: DFA, NFA, their equivalence. Mealy Moore Models, equivalence of Mealy Machine and Moore Machine, Minimization of DFAs.
Regular Expressions, equivalence between FA and regular expression, Pumping Lemma and its use to prove non-regularity of a language, closure properties of class of regular languages, Myhill-Nerode Theorem.

Unit-II:
Formal Languages: Definition of Grammar, Derivation and language generated by Grammar, Chomosky classification of languages, Operations on languages.
Context-Free Grammars and Languages: Derivation, Parse trees, Language generated by a CFG, Eliminating useless symbols, productions, null productions and unit productions. Normal Forms of context free grammars.

Unit- III:
Push Down Automata: Definition, instantaneous description as a snapshot of PDA computation, notion of acceptance of PDAs: Acceptance by final states and empty stack. Push Down Automata and Context Free Languages.

UNIT-IV:
Turing Machines: Definition of TM, instantaneous description as a snapshot of TM computation, notion of acceptance, Acceptability of TM, TM as language acceptors, TM as Transducers, other models of Turing Machine.

Unit-V
Decidability and Complexity Theory: The definition of algorithm, Decidability, Decidable language, Undecidable language, PCP, Growth rate of function, the classes P and NP

Text Books:

1. Theory of Computer Science, K. L. P Mishra & N. Chandrasekaran, PHI Learning.
2. Introduction to Automata Theory, Languages and Computation, J Hopcroft, JD Ullman, R Motwani, Pearson.

Reference Books:

1. Introduction to languages and theory of computation, John C Martin, McGraw Hill.
2. Introduction to Computer Theory, Daniel I.A Cohen, Wiley India

3. Theory of Computation, Lewish Papa Dimutrau, PHI, New Delhi
4. Theory of Computation, M Sipser, Brookscole, Thompson

Web Resources
http://nptel.ac.in/courses/106104028/

List of Practical
Not Applicable.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand basic concepts of formal languages, context-free grammar and languages, push-down automata, turing machine and Decidability and complexity theory.
CO_{02} Analyzing regular expressions and finite automata for language problem-solving.
CO_{03} Applying formal grammar to design languages, Push Down Automata for advanced language problems solving.
CO_{04} Evaluating Turing Machines for Computational Understanding.
CO_{05} Assessing language complexity using Turing machines.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
CA5MC04	Personality Development & Quantitative Aptitude	3	0	0	0

Course Learning Objectives (CLOs):

CLO_{01} To build the logics according to given problems.
CLO_{02} To improve arithmetic, verbal ability.
CLO_{03} To improve aptitude, problem solving skills

Course Outcomes (COs):

Unit- I:
Average, Problems on numbers and ages, Percentage, Profit and loss, Time and Work, Time and distance, Problems on trains, Height and Distance.

Unit-II:
Ratio and proportion, Pipes and Cisterns, Boats and streams, Simple interest, Compound Interest, Mixture, Area, Clocks and Calendars, Geometry, Probability.

Unit- III:
Series, Coding and decoding, Blood Relations, Puzzle Test, Directions sense test, Mirror-Images, Water-Images.

UNIT-IV:
Speaking skills: GDs – do's and dont's, Effective Presentation Skills, Successful Interview techniques, Leadership, Stress Management.

Unit-V
Effective writing skills: E mail communication, Summarizing and paraphrasing, Presentation and documentation of collected data, Making effective PPTs, Writing a research paper.

Text Books:
1. Quantitative Aptitude by R.S. Aggarwal.
2. Verbal and Non Verbal Reasoning by R. S. Aggarwal
3. Koneru Aruna. Professional Communcation. Mc Graw Hill, 2015

Problem and Assignments Book:
1. Quantitative Aptitude by R.S. Aggarwal.

Reference Books:
1. Sharma RC and Krishna Mohan. Business correspondence and report writing. New Delhi: Tata Mc Graw Hill, 2016
2. Rizvi Ashraf. Effective Technical Communication. Tata Mc Graw Hill, 2014".

Web Resources
1. https://www.careerbless.com/aptitude/qa/home.php
2. https://www.toppr.com/guides/quantitative-aptitude/

3. https://www.sawaal.com/aptitude-reasoning/quantitative-aptitude-arithmetic-ability-questions-and- answers.html
4. https://www.freshers live.com/online-test/aptitude-test/questions-and-answers
5. https://www.indiabix.com/aptitude/questions-and-answers/
6. https://affairscloud.com/quantitative-aptitude-questions/

List of Practical

NA

After completion of this course the students shall beable to:

CO_{01}	Perform calculations on various mathematical problems.
CO_{02}	Understand basic formulas of numerical.
CO_{03}	Understand the basic soft skills necessary for a competent IT professional
CO_{04}	Apply the thinking ability of reasoning problems and puzzles
CO_{05}	Apply technical writing skills for E-mail, summarizing, paraphrasing and presentation.

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Medi-Caps University, Indore

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO27	Programming Lab II	0	0	2	2	1

1. Find a number is Armstrong or not
2. Find sum of digits of a number
3. Print Fibonacci series upto n
4. Print prime series upto n.
5. Copy one string into another
6. Concat two strings
7. Find length of a string
8. Search an element from an array
9. Find max or min element from an array
10. Find addition, subtraction, multiplication of two matrices
11. Find addition, subtraction, multiplication and division of two numbers using case switch.
12. Convert one data type to another using wrapper classes
13. Make a class box and find volume of box
14. Make a class student having member variables roll_no and name and member function getData() and putData() to take the data from user and print on the output screen
15. Make a class Complex has two member variables real and imag of float type. Make suitable member functions to add, subtract and multiply two Complex objects.
16. Make a class Employee having member variables name and salary and member functions getData() and putData() to take the data from user and print on the output screen
17. Find area of circle, rectangle and triangle using method overloading
18. Make a class box having three member variables width, height and depth using constructor overloading and parameterized constructor .
19. Write a program having base class Shape having two member variables width and height, two derived classes rectangle and triangle. Write suitable member functions to calculate area in rectangle and triangle class.
20. Apply method overriding on class Figure having member variables dim1,dim2, constructor and area() member function. Extends two classes Rectangle and Triangle from Figure. Write constructor and area() function in Rectangle and Triangle class, apply dynamic method dispatch.
21. Write a program using multilevel inheritance.
22. Write a program using method overriding
23. Write a program using super.
24. Write a program explaining the concept of how constructors are called in inheritance.
25. Write a interface Ishape having functions getArea() and getPerimeter() . Write a class circle implements that interface.
26. Write a program using swing controls to copy one textField to another.
27. Write a program using swing controls to concat two textfield into third.
28. Write a program using swing controls to find factorial of a number and a number is prime ornot.
29. Make an application in swings for student record management using database connectivitywith mysql.
30. Make a web application of shop management using JSP using database connectivity with mysql.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Understand the concepts of basic Java programming, object-oriented Programming, GUI developments, and web applications in Java.
CO_{02}	Apply the concepts of object-oriented programming and Database connectivity in Java programs.
CO_{03}	Analyze the potential of Java language for creating Desktop Applications and web Applications.
CO_{04}	Create a desktop application in Java with database connectivity.
CO_{05}	Create a Web Application in Java.

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Medi-Caps University, Indore

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO28	Advance Programming Lab I	0	0	4	4	2

1. Write a program to solve quadratic equation ax2+bx+c=0
2. Write a program to find series of prime numbers from 100 to 200 using for-else loop.
3. Write nested if statements to print the appropriate message depending on value of variables temperature and humidity as given as follows. Assume that the temperature can only be Warm and Cold & humidity can only be Dry or Humid.

Temperature	Humidity	Print following activity
Warm	Dry	Play Cricket
Warm	Humid	Play Basketball
Cold	Dry	Play Tennis
Cold	Humid	Play Cricket

4. Read a string from a user and print string by removing spaces present in string.
5. Write a program to read password from user. If user types the correct password i.e. 'Python' then display message 'Welcome to python'. Note:-Only 3 attempts are allowed to enter password.
6. Create a list containing name of students and count occurrence of name Neha in the list.
7. Write a program to create a list A to generate squares of numbers (from 1 to 10). List B to generate Cubes of numbers (from 1 to 10) and List C with those elements that are even and present in List A.
8. Consider a list with mixed type of elements such as l1=[1,'x',4,5.6,'z',9,'a',0,4]. Create another list l2 using list comprehension which consist of only integer element present within list l1.
9. Write a program to print all the letters from word1 that also appear in word2.
10. Write a program to read string and display total numbers of uppercase & lowercase letters.
11. Write a program to count length of tuple and find max & min item in tuple.
12. Create two sets s1={1,2,3,4} and s2={2,4,5,6} perform following operations on sets.
    (a) Union (b) intersection (c) difference (d) symmetric difference
    1. Write a program to illustrate use of following types of function:-
    (a) Implementation of positional arguments in a function.
    (b) Implementation of keyword arguments in a function.
    (c) Implementation of default arguments in a function.
    (d) Implementation of variable length arguments.
13. Write a program for returning multiple values from a function.
14. Write a program for Fibonacci series using recursive function.
15. Write a program to remove punctuations from a string.
    Punc=' " ! (Write a function) – [ ] { } ; : ' " \ . <> / @ ? $ # ^ & * % _ ~ ' "
16. Write a function count_letter (word,letter) which takes a word & letter as arguments and returns the number of occurrences of that letter in a word.
17. Write a function split_list(Lst,n), where list Lst should split into two parts by the function and the length of first part is given as n.

18. Write a function is_Lst_palindrome(Lst) to check weather a list is palindrome. Function should return true if the list is palindrome and false if not palindrome.
19. Write a function that takes any two arguments. One argument is the name of the employeeand the other argument is the PF. The default PF is 30000.
20. Write a program that has class student with method subject. Create two subclasses data science and computer science. Now access the method subject explicitly with the class computer science and implicitly with the class data science.
21. Write a program to create class student and make two methods inside the class get information() to get and display info() to print information of the student.
22. Program to implement the concept of method overloading.
23. Program to use special method to compare two objects.(Operator overloading)
24. Write a program to illustrate the use of___init___and___del__method.
25. Write a program to inherit attributes of the parent class to a child class.
26. Write a program to override Display () method in multiple inheritance using super ().
27. Write the numbers from 1 to 20 to the output file WriteNumbers.txt.
28. Write a function Find Largest () which accepts a file name as parameter and reports the longest Line in the file.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand the concepts of basic data types, control structures, functions and its types, List,tuple, set, dictionary .
CO_{02} Apply the basic and user-defined data structures as per the need of the problem.
CO_{03} Solve basic mathematical problems using Python programming
CO_{04} Analyze the use of OOP concepts in Python to solve complex problems.
CO_{05} Evaluate various methods to Store, retrieve, and manipulate data with disk files.

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Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO29	Computer Networks Lab	0	0	2		1

List of Practical's:

1. Discussion about guided media and unguided media with their practical characteristics.
2. Explanation of IP classes and addressing scheme.Explanation of IPV4 and IPV6.
3. Explanation of networking and internet working devices with their application.
4. Explanation of Packet Tracer.
5. Installation of Packet Tracer .
6. Explanation of Basic Commands of Packet Tracer.
7. Simulation of LAN using Hub .
8. Simulation of LAN using Switch .
9. Simulation of LAN using Repeater.
10. Simulation of connecting two different LAN using routers performing.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Understand the basic concepts of networks, network devices, and transmission media.
CO_{02} Apply basic concepts of Hub, Switches, and Repeater for transmission of data.
CO_{03} Analyze different IP Classes of networks and their addressing schemes.
CO_{04} Differentiate between IPV4 and IPV6
CO_{05} Simulate the working of the switch, hub, repeater, and Router.

Medi-Caps University, Indore
Computer Applications
Model Scheme for MCA (Batch 2023-25)

Second Year - Semester III (Odd Sem)

SEMESTER – III						
S.N.	**Course Code**	**Courses**	**L**	**T**	**P**	**Credit**
1	CA5CO30	Internet & Web Technologies	3	0	0	3
2	Elective - III	Elective - III	4	0	0	4
3	Elective - IV	Elective - IV	4	0	0	4
4	Elective - V	Elective - V	4	0	0	4
5	Open Elective - II	Open Elective - II	3	0	0	3
6	CA5CO37	Mobile Application Development Lab	0	0	2	1
7	CA5CO32	Advance Prgramming Lab II	0	0	2	1
8	CA5PC03	Minor Project	0	0	4	2
		Total	**18**	**0**	**8**	**22**
		Total Contact Hours	**26**			

Electives:

CA5EL50	Cloud Computing
CA5EL06	Mobile Communications
CA5EL12	Cyber Security
CA5EL13	Cloud Security
CA5EL52	Machine Learning
CA5EL08	Software Project Management
CA5EL28	Network Security
CA5EL53	Internet of Things
CA5EL27	Mobile Application Development

Open Elective - II

OE00046	Software Testing

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO30	Internet & Web Technologies	3	0	0	3	3

Course Learning Objectives(CLOs):

CLO_{01} To learn the basic web concepts and Internet protocols.
CLO_{02} To familiarize with Scripting Languages.
CLO_{03} To study HTML, CSS, PHP

Prerequisites : NIL
Co-requisites : NIL

Unit-I Web Essentials
World Wide Web, Web versions, HTTP request message-response message, Web Clients, Web Servers and Web Applications Development. Anatomy of Web Page, How Web works, Role of Web Designer. Future of web.

Unit-II HTML

Introduction to HTML, HTML Tags, Text Formatting, Tables, Lists, adding graphics to HTML page, creating tables, linking documents, frames, HTML Forms.

Unit –III CSS
Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties), CSS Color

Unit –IV PHP
Overview of PHP, PHP Setup, Syntax of PHP, variable, constant, data types, operator, control statement, PHP date and time, PHP form, PHP Mail, Introduction to MySQL, PHP and MySQL connectivity, PHP login.

Unit-V Website Planning & Hosting
Introduction, Webpage, website, How website is different form portal, Components of website, Elements of website, Construction of website, Website Development & publishing, Website Designing, Website Development Language, Website URL Registration, Website hosting, Website Security.

Text Books:

1. Web Design The complete Reference, Thomas Powell, Tata McGrawHill
2. HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
3. PHP and MYSQI, Vikram Vanvanshi, Tata McGrawHill
4. PHP : The Complete Reference By Steven Holzner, Tata McGrawHill
5. Michel Morrison -HTML and XML for Beginners, PHI

Reference Books:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.
2. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
3. Godbole A. S. & Kahate A., Web Technologies, TMH.
4. Developing Web Applications in PHP and AJAX, Harwani, McGrawHill
5. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication

Web Source:

1 . https://getbootstrap.com/
2. www.tutorialspoint.com
3. www.tizag.com

Course Outcomes:

After completion of this course the students shall be able to:

CO_{01}	Understand the Basics of WWW, HTML, CSS, PHP, Web Hosting, and Web Security.
CO_{02}	Apply the knowledge of HTML and CSS for designing Web pages.
CO_{03}	Analyze the output of coding done through HTML, CSS, and PHP and can host a website.
CO_{04}	Evaluate the design done in projects and construct a web page.
CO_{05}	Create websites and do a small project.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5EL50	Cloud Computing	4	0	0	4	4

Course Learning Objectives (CLOs):

- **CLO_{01}** Understand various basic concepts related to cloud computing technologies.
- **CLO_{02}** Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
- **CLO_{03}** Understand the underlying principle of cloud virtualization, cloud storage, datamanagement and data visualization.
- **CLO_{04}** Understand different cloud programming platforms and tools

Prerequisites Nil
Co-requisites: Nil

Curriculum:

Unit-I

Introduction: Historical development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, Cloud adoption and rudiments Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis, Satellite Image processing, CRM and ERP.

Unit-II

Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance; Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings:Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.

Unit –III

Cloud Management & virtualization technology: resiliency, provisioning, asset management, Concepts of map reduce, cloud governance, high availability and disaster Recovery. Virtualization: Fundamental concepts of compute, storage, networking, desktop and application virtualization .Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisor management software, Infrastructure Requirements, Virtual LAN(VLAN) and Virtual SAN(VSAN) and their benefits.

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Unit-IV

Cloud Security: Cloud Information security fundamentals, Cloud security services, Design Principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management,Cloud Computing SecurityArchitecture.

Unit-V

Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, Third Party Cloud Services. Case study: Google AppEngine, Microsoft Azure, Hadoop, Amazon, Aneka.

Text Books

1. Buyya, Selvi, Mastering Cloud Computing , TMH Pub
2. Kumar Saurabh, Cloud Computing, Wiley Pub.

Reference Books::

1. Krutz , Vines, Cloud Security, Wiley Pub
2. Velte, Cloud Computing- A Practical Approach, TMH Pub
3. Sosinsky, Cloud Computing
4. Dimitris N. Chorafas, Cloud Computing Strategies, CRC Press

Web Source:

1. https://www.ibm.com/cloud/learn/what-is-cloud-computing
2. https://www.globaldots.com/cloud-computing-types-of-cloud
3. https://www.cisco.com/c/en/us/about/press/internet-protocol.../123-cloud1.html

Open Learning Source:

1. https://onlinecourses.nptel.ac.in/noc17_cs23
2. https://www.openstack.org

Course Outcomes:

After completion of this course the students shall be able to:

CO_{01}	Develop and deploy cloud application using popular cloud platforms.
CO_{02}	Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and building private cloud.
CO_{03}	Explain and identify the techniques of big data analysis in cloud.
CO_{04}	Compare, contrast, and evaluate the key trade-offs between multiple approaches to cloud system design, and identify appropriate design choices when solving real- world cloud computing problems
CO_{05}	Write comprehensive case studies analyzing and contrasting different cloud computing solutions.
CO_{06}	Make recommendations on cloud computing solutions for an enterprise

Course Code	Course Name	Hours per Week			Total	Total
		L	T	P	Hr	Credit
CA5EL13	Cloud Security	4	0	0	4	4

Unit- I : Security Concepts

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defense in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS.e.g. User authentication in the cloud.

Unit-II: Security Fundamentals and Risk Issues in the Cloud

Cloud Information Security Objectives, Cloud Security services, Cloud Security Design Principles, Secure Cloud Software Requirements, Security Policy Implementation and decomposition, Cloud Computing and Business Continuity/Disaster Recovery, CIA triad, Privacy and compliance risk.

Unit- III: Identity and Access Management

Introduction**, Definitions**, Trust Boundaries, Challenges, Architecture and Practices, Getting Ready for the Cloud, Relevant IAM Standards and Protocols for Cloud Services, Cloud Authorization Management, Cloud Service Provider IAM Practice.

Unit-IV: Security Management in the Cloud

Security Management Standards, Security Management, Availability Management, SaaS Availability Management, PaaS Availability Management, IaaS Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.

Unit- V: Legal and Compliance Issues

Responsibility, ownership of data, right to penetration test, local law where data is held, examination of modern Security Standards (eg.PCIDSS), how standards deal with cloud services and virtualization, compliance for the cloud provider vs. compliance for the customer.

Text Books

1. Tim Mather, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy, O'Reilly.
2. Raghu Yeluri, Enrique Castro-Leon, Building the Infrastructure for Cloud Security A Solutions view, Apress open.
3. Ronald L. Krutz, Russell Dean Vines, Cloud Security A Comprehensive Guide to Secure Cloud Computing, Wiley.

References

2. John Rittinghouse, James Ransome, Cloud Computing, *CRC* Press.
3. J.R. ("Vic") Winkler, Securing the Cloud, Syngress.
4. Cloud Security Alliance, Security Guidance for Critical Areas of Focus in Cloud Computing, 2009.

Course Outcomes:

After completion of this course the students shall be able to:

CO_{01}	Understand basic cloud security concepts, cloud security principles, practices, and technologies in different service and deployment models, and legal and compliance issues.
CO_{02}	Design and implement security policy, and develop highly secure cloud-based applications by creating and configuring IAM architecture and practices.
CO_{03}	Apply IAM Practices and security management while developing real-world cloud computing applications.
CO_{04}	Compare, contrast, and evaluate the key trade-offs between multiple approaches to cloud system security design, and identify appropriate design choices when solving real-world cloud computing Problems.
CO_{05}	Analyze different security standards like PCIDSS, GDPR, HIPPA, etc.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5EL53	Internet of Things	4	0	0	4	4

Course Learning Objectives(CLOs):

CLO_{01} To understand the fundamentals of Internet of Things.
CLO_{02} To learn about the basics of IOT protocols.
CLO_{03} Explore on use of various hardware and sensing technologies to build IoT applications.
CLO_{04} To build a small low cost embedded system using Raspberry Pi.
CLO_{05} To apply the concept of Internet of Things in the real world scenario.

Prerequisites : Nil **Co-requisites** : Nil**Curriculum**:

Unit-I Introduction

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, IoT levels and deployment, domain specific IoTs. Introduction to Arduino and Raspberry Pi

Unit-II IoT and M2M

Machine-to-Machine (M2M), Difference between M2M and IoT, M2M Value Chains, IoT Value Chains, SDN (Software Defined Networking) and NFV (Network Function Virtualization) for IoT, Data Storage in IoT, IoT Cloud Based Services.

Unit-III IOT Protocols

Wi-Fi (IEEE 802.11), Bluetooth, ZigBee (IEEE 802.15.4), IPv4, IPv6, 6LoWPAN. TCP, UDP, Constrained Application Protocol (CoAP), MQ Telemetry Transport (MQTT), XMPP, AMQP, HTTP, Web Sockets.

Unit –IV Web Of Things

Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT , Unified Multitier WoT Architecture, WoT Portals and Business Intelligence.

Unit-V IOT Applications

IoT applications for industry: Future Factory Concepts, Greenfield andBrownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware

List of Practical's: Nil

Text Books:

1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry; 1st Edition, 2018, Pearson India Pvt. Ltd.

2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti, 1st

Edition, 2015, Universities Press (India) Pvt. Ltd.

3. Rajkamal,"Internet of Things", Tata McGraw Hill publication

4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence",.

5. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD)

Reference Books:

1. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley
2. Dimitris N. Chorafas, Cloud Computing Strategies
3. Velte, "Cloud Computing- A Practical Approach", TMH Pub
4. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers

Web Source:

1. https://dzone.com/articles/introduction-to-iot-sensors
2. https://www.cisco.com/c/dam/en_us/solutions/trends/iot/introduction_to_IoT
3. https://www.codeproject.com/Articles

Open Learning Source:

1. https://onlinecourses.nptel.ac.in/noc17_cs22
2. https://github.com/connectIOT/iottoolkit

Course Outcomes:

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

CO_{01} Understand the basics of IoT, applications of IoT, M2M,IoT protocols and Web Of Things.

CO_{02} Analyze Data, Knowledge Management and use of Devices in IoT Technology

CO_{03} Apply interfacing techniques for hardware & Sensor connectivity

CO_{04} Analyze the use of IoT platforms for real-world applications

CO_{05} Compare between different IoT protocols, Iot and WoT

Course Code	Course Name	Hours per week			Total	
		L	T	P	Hrs.	Credits
CA5EL52	Machine Learning	4	0	0	4	4

Course Learning Objectives (CLOs):

- **CLO_{01}** Understand the fundamentals of Machine Learning Techniques
- **CLO_{02}** Understand supervised learning techniques, such as regression and classification andintricacies of ML algorithms
- **CLO_{03}** Become familiar with unsupervised learning techniques, such as clustering and association and understand different dimensionality reduction techniques.
- **CLO_{04}** Become familiar with neural network
- **CLO_{05}** Become familiar with ensemble methods

Prerequisites: Nil
Co- requisites: Nil

Curriculum:

UNIT-I-Introduction to Machine Learning

What is Artificial Intelligence, What is Machine Learning, AI vs. ML, Applications of ML, Types of Machine Learning Algorithms, AI vs. ML vs. DL, Data Mining vs. Machine Learning vs. Big Data Analytics, Essential Mathand Statisticsfor ML.

UNIT-II- Supervised Learning

Introduction to Supervised Learning,Linear Regression: Cost function, Gradient descent, learning rate; Classification: Logistic Regression, Nearest-Neighbors,Naive Bayes classifier.Overfitting and Underfitting, feature scaling, Regularization, Bias and Variance, Decision Trees, Introduction to Support Vector Machines, Applications.

UNIT-III-Unsupervised Learning

Clustering: K-means, hierarchical, Association analysis: Apriori algorithm, Dimensionality Reduction: Subset Selection, Principal Components Analysis,LinearDiscriminant Analysis,Introduction to Reinforcement learning, Applications.

UNIT-IV- Ensemble Methods

Evaluating Machine Learning algorithms and Model Selection, Ensemble Methods: Mixture Models, Classifier using multiple samples of the data set, improving classifier by focusing on error, weak learner with a decision stump, Bagging, Stacking, Boosting, Implementing theAdaBoost algorithm, Classifying with AdaBoost Bootstrapping and cross validation.

UNIT-V-Introduction to Deep Learning

Introduction to Neural Network, Perceptron, Feed forward, Back Propagation, Back propagation with simple example Convolution Neural Network and its types.

Case Studies:

Not Applicable

List of Practical:

Not Applicable

Text Books:

1. Machine Learning, Tom Mitchell, McGraw Hill.
2. Aurelien Geon, "Hands-On Machine Learning with Scikit-Learn and Tensorflow:Concepts, Tools, and Techniques to Build Intelligent Systems", Shroff/O'Reilly
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning,Springer (freely available online)
4. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.

Reference Books:

1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer.
2. Hal Daumé III, A Course in Machine Learning (freely available online)
3. Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow, Packt Publishing.

Web Source:

1. https://www.coursera.org/learn/machine-learning
2. https://www.kdnuggets.com
3. https://towardsdatascience.com
4. https://www.analyticsvidhya.com

Course Outcomes (Cos):

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

CO_{01}	Understand the concept of Machine learning and the range of problems that can be solved by machine learning.
CO_{02}	Compare different types of learning algorithms and their applications.
CO_{03}	Interpret machine learning problems.
CO_{04}	Apply Machine learning techniques for problem solving.
CO_{05}	Identify methods to improve machine learning results for better predictive performance.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
OE00046	Software Testing	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO_{01}	To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
CLO_{02}	To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
CLO_{03}	It also helps to learn the types of bugs, testing levels with which the student can verywell identify a bug and correct as when it happens.
CLO_{04}	It provides knowledge on transaction flow testing and data flow testing techniques sothat the flow of the program is tested as well.
CLO_{05}	To learn the domain testing, path testing and logic based testing to explore the testing process easier.
CLO_{06}	To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
CLO_{07}	To gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.
CLO_{08}	To gain the techniques and skills on how to use modern software testing tools to support software testing projects
CLO_{09}	To enable the students to use the knowledge for practical cases.

Prerequisites:

1. Proper knowledge on software engineering and their concepts .
2. Enough knowledge on object oriented modeling and techniques.
3. Knowing the different types and levels of software testing process.
4. Good programming skills and debugging skills.

Co-Requisites: NILCurriculums:

Unit I

Introduction to Testing: Introduction to Software Testing, Objectives of Software Testing, role of the tester, need of testing, what are defects, software defects and Quality, Concept of software lifecycle and testing role.

Unit II

Software Testing Methods Used in Industry: White Box testing And Black Box Testing**.** Functional Testing (Black Box) Equivalence partitioning, Effect graphing, Syntax testing Structural Testing (White Box) Coverage testing, Statement coverage, Branch & decision coverage, Path coverage Domain Testing Non functional testing techniques: Localization, Internationalization Testing Black box vs. White Box

Unit III

An introduction or familiarization of various popular testing types: Regression Testing, Ad Hoc Testing, Smoke Testing, Sanity Testing, Usability Testing, Exploratory Testing, Compatibility Testing, Installation Testing, Non Functional Testing such as Load Testing, Stress Testing, Volume Testing. **Software Testing Life Cycle:** Overview of the stages of STLC: Test Planning,

Test Designand Test Execution.

Unit IV

Test Templates creation and use: Test Scenario template **(**what are they, how to write them, why, when, etc.**),** Test case template, Test Plan, Defect Report, Status report.

Defect management: Defect Classification, Finding defects, Logging defects, tracking and managing defects and Defect life cycle.

Unit V

Test Management Tool: Test Management tool and why we need them, prerequisites to test planning, understand the characteristics of the software being developed, Build the test plan and write the test plan.

Automation Testing : Automated Testing, QTP (HP) Automated Process and Selenium open Source.

List of Practicals:

Not Appicable.

Project:

Optional.

Text Books:

1. C Padmini, Andreas Spillner, Tilo Linz, Hans Schaefer, Software Testing Foundations, Shoff Publishers and Distributors
2. D Srinivasan and R Gopalswamy, Software Testing: Principles and Practices Pearson

References:

1. Foundations of Software Testing by Aditya P. Mathur – Pearson Education.
2. Testing Object Oriented Systems: models, patterns and tools, Robert V Binder, Addison Wesley.
3. Software Engineering – A practitioner's approach by Roger S. Pressman, 5th Edition, McGraw Hill
4. G J Myers The art of software testing, Wiley.

Web Source:

1. http://www.softwaretestinghelp.com
2. http://www.testingexcellence.com
3. http://www.guru99.com
4. http://weekendtesting.com
5. https://www.tutorialspoint.com

Open Learning Source:

1. http://nptel.ac.in/course.php.
2. https://www.tutorialspoint.com
3. https://swayam.gov.in/course/3667-software-testing

Course Outcomes (COs):

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

CO_{01}	Understand the basic concepts of software testing, various testing types, popular testing methods used in industry, defect management,STLC, and automation testing.
CO_{02}	Apply knowledge to identify the various defects and correct them after knowing the consequences of the defects.
CO_{03}	Apply appropriate software testing tools, techniques, and methods for developing more effective systems during both the test planning and test execution phases of a software development project
CO_{04}	Evaluate different testing methods and select optimal testing methods according to functionalities.
CO_{05}	Create test plans, test scenarios, and test cases for a particular product to test and conduct testing effectively.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO32	Advance Programming Lab II	0	0	2	2	1

List of Experiments

1. Create a 3×3 numpy array of all True's (Boolean)
2. Get the common items between array1 and array2
3. Swap rows 1 and 2 in the array.
4. Reverse the columns of a 2D array.
5. Print or show only 3 decimal places of the numpy array.
6. how to compute mean, median and standard deviation of an array.
7. Create pandas series from different data types like list, numpy array and dictionary.
8. Retrieve the first field in df from any csv?
9. How to get the items of series A not present in series B.
10. How to get the items not common to both series A and series B?
11. Calculate the frequency counts of each unique value in series.
12. How to extract items at given positions from a series.
13. Retrieve data from any CSV file(eg. Olympics.csv)
    (a) Which country has won the most gold medals in all games?
    (b) Which country has won the most gold medals in summer games?
    (c) Which country has won the most gold medals in winter games?
    (d) Which country had the biggest difference between their summer and winter goldmedal counts?
    (e) Which country has the biggest difference between their summer and winter goldmedal counts relative to their total gold medal count?
    (f) Only include countries that have won at least 1 gold in both summer and winter.
14. Draw boxplot for following data
    [3,5,8,8,9,11,12,12,13,13,16]
    [220,252,256,312,332,332,400]
    [18,25,29,33,44]
    [19, 12, 9, 7, 17, 10, 6, 18, 9, 14, 19, 8, 5, 17, 9]
15. Calculate total sale data for last year for each product and show it using a Pie chartfrom Electronics_data.csv

Note: In Pie chart display Number of units sold per year for each product in percentage.

16. Implementation of Linear Regression.
17. Implementation of Logistic Regression
18. Implementation of K-means.
19. Implementation Naive Bayes classifier.
20. implementation of K-Nearest-Neighbours.

Course Outcomes (COs):

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

CO_{01}	Understand the concept of Machine learning and the range of problems that can be solved by machine learning.
CO_{02}	Compare different types of learning algorithms and their applications.
CO_{03}	Interpret machine learning problems.
CO_{04}	Apply Machine learning techniques for problem solving.
CO_{05}	Identify methods to improve machine learning results for better predictive performance.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CA5CO37	Mobile Application Development Lab	0	0	2	2	1

Course Learning Objectives (CLOs):

CLO_{01} To improve programming skills.
CLO_{02} To enable the students to work with UI design.
CLO_{03} To enable the students to build mobile applications using advance UI programming.
CLO_{04} To explain the way of working with database using Android.

Prerequisites: NIL

Co-requisites: NIL

Curriculum:
Creating first Android Application, Introduction to GUI objects: Button, TextView, EditText, RadioButton, CheckBox, ListView, Spinner, ToggleButton.
Event driven Programming in Android.
Menus, sliding menu using navigation drawer, Dialog and Toast in Android, Sending e-mail,sms and phone calls.
Understanding of SQLite database, connecting with the database, read, edit and delete to the database.

Case Studies:

Not Applicable.

List of Practicals:

1. Write a program to design User Login using Absolute, Linear, Relative and TableLayout.
2. Write a program to change text of text view on button Click.
3. Program to show length of EditText on button click.
4. Write a program to copy text from one EditText into another EditText on button click.
5. Write a program to concat text of two EditText into third EditText on button click.
6. Write a program that display gender male or female using radio buttons insideradioGroup. On a Button click show the gender selected by the user using Toast.
7. Write a program that displays the languages using checkbox. On a Button click showthe languages selected by the user in the TextView.
8. Write a program having two activities. Enter Text in first Activity and it should be displayed in second Activity.
9. Write a program to change screen color as per the user choice from a Menu.
10. Write a program to go to a particular activity depends upon item selected from ListView(use OnItemClickListener event handler).
11. Write a program to show the selected item from Spinner into the TextView (use OnItemSelectedListener event handler).
12. Write a program for sending email, phone call and SMS.
13. Create an application using Sliding Menu.
14. Create an application using navigation drawer.

15. Write a program to show, insert, update and delete a record from the database.

Project:

Small mobile app for student record system.

Text Books:

1. Android application development for java programmers. By James C. Sheusi, Cengage Learning.
2. Professional Android 2 Application Development .By Reto Meier, Wiley India PvtLtd.
3. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd.
4. Professional Android, Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd.

Reference Books:

1. Android Studio Development Essentials by Neil Smyth
2. The Definitive Guide to SQL Lite by Michael Owens
3. Android by Prasanna Kumar Dixit publisher: Vikas Publishing.

Web Source:

1. https://nptel.ac.in/courses/106106147
2. https://www.nielit.gov.in/

Open Learning Source:

1. https://www.coursera.org/courses?languages=en&query=android
2. https://developer.android.com/guide/
3. http://docs.oracle.com/javase/tutorial/index.htm
4. https://www.udemy.com/complete-android-developer-course/
5. https://www.lynda.com/Android-training-tutorials/947-0.html

Course Outcomes (COs):

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

CO_{01} Understand the concept of Mobile Application Development, Android OS, Android architecture, and its features.

CO_{02} Apply the concepts of different Android UI Layout and activity life cycle expressions for GUI design

CO_{03} Demonstrate event-driven programs in different GUI.

CO_{04} Evaluate the use of menus, toast, adapters, and dialog boxes, Sending e-mail, SMS, phone calls, and SQLite for the development of Android Applications.

CO_{05} Develop basic Android applications.

Medi-Caps University, Indore
Computer Applications
Model Scheme for MCA (Batch 2023-25)

Second Year - Semester IV (Even Sem)

SEMESTER – IV Scheme						
S.N.	**Course Code**	**Courses**	**L**	**T**	**P**	**Credit**
1	CA5PC04	Major Project	0	0	24	12
		Total	**0**	**0**	**24**	**12**