UNION CHRISTIAN COLLEGE, ALUVA
(AUTONOMOUS)



MASTER OF COMPUTER APPLICATIONS

REGULAR (2 YEARS)

SYLLABUS & COURSE CONTENT

(FROM 2026 ADMISSION ONWARDS)

Bridge Course

Course Code	Course Title	Specific Titles	No of Hours
MCA BC01	**Computer Fundamentals and Hardware**	**Computer Fundamentals**-History and Generations of Computer, Basic parts of Computer, Identification of the internal and external hardware/peripheral components. Illustrate the booting procedure (using windows and Linux).	**4**
MCA BC02	**Foundations of Mathematics and Statistics concepts**	**Fundamentals of Statistics-** Measures of central tendency and dispersion- Mean, Median, Mode, Mean deviation, Standard deviation, variance, covariance. **Matrices-** Definition, types of matrices, row canonical form, **Elementary combinatorics**- Permutation and combination.	**8**
MCA BC03	**Digital Fundamentals**	**Digital Fundamentals**-Digital Systems and logic families, AND, OR, NOT, NAND, NOR, Universal Gates-Properties and Exclusive-OR operations. Classification of Number System, Types of Number System, Conversions from One Base to Another,	**6**
MCA BC04	**Problem Solving Techniques**	**Programming Fundamentals**-Generation of programming, introduction to various types of programming (Assembly, machine level, application, web etc….). Algorithm, Flowcharts, Design algorithm and flowchart for simple sequential problems. Design algorithm and flowchart for control structures (decision making and iterative)	**6**
MCA BC05	**Fundamentals of Computer Networks**	**Network Fundamentals**-Analog and Digital communication, bitrate, baud rate, Types of network (LAN, WAN etc…,), Types of Transmission Media-Guided and Unguided media, Topologies, Internet, Intranet, switching devices and Client/Server Technology.	**4**
MCA BC06	**Introduction to Operating system and DBMS**	**OS Fundamentals**-Operating system functions, Different types of OS, Comparison between windows & Linux operating system, Compiler, Assembler and Interpreter, **Introduction to DBMS**-Database, Table, Field, Row, Domain	**4**
MCA BC07	**Introduction to Web Technology**	**Introduction to HTML**-HTML Tags, Document Heading, Page title, Page's content, Section heading, A paragraph. A link, inserting an image. **Introduction to CSS**-CSS Building blocks, Styling Text and CSS layouts.	**8**
Total Hours			**40**

Course Content - Semester 1

Course Code	Course Title	No of hours per week		Continuous Evaluation (Marks)	Summative Evaluation (Marks)	Total Marks	No. of Credits
		L	P				
MCACT101	Mathematical & Statistical foundation for Computer Applications	4	-	25	75	100	4
MCACT102	Digital Logic & Computer Organization	4	-	25	75	100	4
MCACT103	Structured programming in C	4	-	25	75	100	4
MCACT104	Computer Networking with TCP/IP	4	-	25	75	100	4
MCACT105	Operating System	4	-	25	75	100	4
MCACP106	Database technology Lab(Mysql & Mongodb)	-	4	25	75	100	2
MCACP107	Software Development Lab- I (C programming)	-	4	25	75	100	2
MCACT108	Employability Skill Training-Phase 1	2	-	50	0	50	1
Total		22	8			750	25

Course Code	Course Title	Total Credits
MCACT101	**Mathematical & Statistical foundation for Computer Applications**	**4**

Course Objectives

The course aims to :

- Explain the underlying concepts and tools in Discrete Mathematics with emphasis on their applications to Computer Science.
- Familiarize the students with the scope and applications of Statistical theory in Computer Applications.
- Impart insights about the concepts of Probability, Tests of significance, and Tests of the hypothesis as the basis of Inferential Statistics.

Module No.	Title & Contents	No. of Sessions
1	**Set theory:** Definition, Types of sets, Set Operations **Relations:** Definition, Representation of relations as matrices and diagrams, Properties of binary Relations-Reflexive, Symmetric, Transitive, Antisymmetric, Equivalence relations, Partial ordering. **Functions:** Definition, Injective and Surjective Functions, Composition of functions.	8
2	**Mathematical Logic:** Introduction, Connectives, Truth tables, Tautology and contradiction, Logical implications equivalence formulas, Inference theory-Validity by truth table, Rules of Inference.Methods of proof- Direct, Indirect and contradiction. **Predicate calculus**: Predicates, statement functions, variables and quantifiers, predicate formulas, free and bound variables, the universe of discourse.	8
3	**Correlation & Regression:** Types of correlation, KPCC, Rank Correlation, Lines of regression, estimation using regression. **Probability Theory**-Random experiments, sample space-Types of events, Addition and multiplication rule, Conditional Probability, Bayes theorem, and its applications	10
4	**Random variables-** Discrete and continuous- Probability mass and density function – Distribution Function -Joint distributions-Marginal Distributions -Standard Distribution- Binomial, Poisson and Normal Distributions **Sampling theory-**Population & Sample, Types of sampling-Parameter & Statistics- Sampling Distribution- Central Limit Theorem(Statement only) **Theory of Estimation**: Basic concepts- Point estimation & Interval Estimation (Just concepts)	11
5	**Testing of Hypothesis** -Null & Alternate Hypothesis, critical region and level of significance- One-tailed and two-tailed test -Types of errors-procedure for testing hypothesis	11

	Large sample test - Single mean and difference of means **Small Sample test-** t-test for Single mean and Difference of means, Paired t-test, Single variance, Chi-square test for goodness of fit and Independence of attribute	

Text Books & References

1. Discrete Mathematical Structures with Applications to CS; Tremblery, R.Manohar, TMH
2. Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications.
3. Discrete Mathematics and Its Applications by Kenneth H Rosen. Tata McGraw-Hill Publications Co. Ltd.
4. Discrete Mathematics, by Kenneth A. Ross, Charles, B. Wright, Pearson Education.; Dorling Kindersley India Pvt. Ltd.
5. Discrete and Combinatorial Mathematics, by Ralph P. Grimaldi and Ramana B. V., Pearson Education.
6. Probability and Statistics, Biswal, Purna Chandra Description: New Delhi PHI Learning Pvt. Ltd. 2007 Edition: 1st ed. : xiii,374p. ISBN: 9788120331402
7. Probability and Statistics. Mendenhall, William; Beaver, Robert J; Beaver, Barbara M Description: New Delhi Cengage Learning India Private Limited

Course Outcomes

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

- Explain the fundamental concepts of set theory, relations, and functions and illustrate their applications in computational problem-solving.
- Explain the fundamental concepts of mathematical logic and predicate calculus, construct truth tables, analyze logical implications, and apply various proof techniques to validate logical arguments.
- Explain the concepts of correlation, regression, and probability theory, analyze relationships between variables using correlation and regression techniques, and apply probability rules and Bayes' theorem to solve real-world problems.
- Define fundamental concepts of random variables, probability distributions, and sampling theory, analyze their properties, and apply them to make statistical inferences and estimations.
- Describe the key concepts of hypothesis testing, formulate and test statistical hypotheses using appropriate large and small sample tests, analyze test results, and evaluate findings to make informed data-driven decisions.

Course Code	Course Title	Total Credits
MCACT102	**Digital Logic & Computer Organization**	**4**

Course Objectives

- To introduce the concepts of binary arithmetic, complements of binary number system and computer codes
- To understand the basics of Boolean algebra and familiarize the design and operations of digital circuits
- To impart knowledge in basics of computer organization
- To familiarize the concepts of memory and input-output organization
- To introduce the concepts of advanced computer architecture

Module No.	Title & Contents	No. of Sessions
1	**Binary Arithmetic And Binary Codes** **Binary arithmetic**–Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division**Representation of signed numbers**–Sign magnitude form, Complement form : 2's complement and 1's complement method, 2's complement Arithmetic,1's complement Arithmetic **BinaryCodes** - Introduction to 8421 BCD, BCD addition and subtraction, Gray code, Conversion from Binary to Gray and vice versa **Error detecting codes**: Parity, Check Sum, Block parity **Error correcting codes**: 7 bit Hamming Code **Alphanumeric codes**: ASCII, EBCDIC	9
2	**Boolean Algebra And Digital Circuits** **BooleanAlgebra**–Axioms and laws of Boolean algebra with algebraic proof and truth table, Reducing Boolean Expressions: Algebraic method, Karnaugh map method in SOP, POS, Don't care condition (upto 4 variables), **Combinational circuits**–Adders(Half adder, Full Adder), Magnitude Comparator(1 bit and 2 bit comparator), Multiplexers (2 input, 4 input multiplexer). **Sequential circuits** - Flip Flops :RS flip-flop, D- flip-flop, JK, T flip-flop(Block diagram, Logic diagram,truth table, Characteristic equation) **ShiftRegisters** - Serial in serial out, Serial in Parallel out, Parallel in serial out, Parallel in Parallel out shift registers(logic diagram)	10
3	**Processing Unit Concepts** **Basic structure of computer**- Types and Functional Units, Performance :processor clock, Basic performance equation **Machine Instructions and Programs**- Memory Locations and addresses, Byte Addressability, Memory Operations, Instructions and Instruction sequencing,Addressing Modes, Basic Input Output Operations. **Computer Arithmetic**- Fast Adders, Signed Addition and Subtraction, Multiplication of positive numbers,Booth's algorithm **RISC:** RISC characteristics and CISC characteristics	10

4	**Main Memory And I/O Organization** **Main Memory** - Memory Hierarchy: Main memory, RAM : Semiconductor RAM memories, ROM , Cache Memory, Secondary memory, Performance Considerations **Input / Output Organization** - Accessing I/O devices, I/O techniques: Program Controlled I/O, Interrupts, Direct Memory Access(DMA) **Interrupts:** Interrupt processing, Interrupts Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices	10
5	**Advanced Computer Architecture** **Basic Parallel Processing Architecture** - Flynn's Classification : SISD, MISD, SIMD, MIMD structures, Classification of Parallel Structures(SIMD) : Array Processors, Vector processors	9

Text Books & References

1. Fundamentals of Digital Circuits, A. Anand Kumar,4th Edition, PHI, 2018
2. Digital Logic and Computer Design, Morris Mano, PHI, 2016.
3. Digital Fundamentals, Thomas L. Floyd, Pearson Education, 11th edition, 2018
4. Computer Organization, V. Carl Hamacher, Zvonko Vranesic, Safwat Zaky. Mc-Graw Hill International Edition, 5th Edition.C
5. Computer Organization and Architecture, William Stallings, Pearson, 10th Edition
6. Computer System Architecture, M. Morris Mano, Pearson, 3rd Edition
7. Computer Architecture and Parallel Processing by Kai Hwang, Faye A. Briggs, Tata Mc Graw Hill Edition

Course Outcomes

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

- Apply binary arithmetic operations on signed & unsigned numbers, examine the error detection & error correction codes, and compare the alphanumeric codes.
- Evaluate the expression using Boolean algebra and explain combinational circuits, sequential circuits, and shift registers.
- Understand the internal organization of computers and memory units and compare RISC & CISC characteristics.
- Classify the memory architecture, explain the Input/output organization to perform I/O operations,utilize interrupts in handling device requests and define Direct Memory Access operations.
- Examine the advanced computer architecture with parallel processing and multiprocessing.

Course Code	Course Title	Total Credits
MCACT103	**Structured programming in C**	**4**

Course Objectives

The course aims to

- Enhance the logical and problem solving skills of the students by focusing on the features of the C programming language.
- Build interest and confidence among them to design programs for real world problems.

Module No.	Title & Contents	No. of Sessions
1	**Introduction To C**: The C Character Set, Identifiers And Keywords, Data Types, Constants, Variables, Declarations, Expressions, Statements. **Data Input And Output**: Single Character Input, Single Character Output, Scanf, Printf, **Operators And Expressions**: Arithmetic Operators, Unary Operator, Relational And Logical Operator, Assignment Operators, The Conditional Operator, Type Conversion, Typedef Introduction To Pre-processor Directives.	10
2	**Control Statements**: If Else Statement, Switch Statement, Break Statement, Continue Statement, Looping Structures - While Statement, Do-while Statement, For Statement **Functions:** Defining A Function, Accessing A Function, Function Prototypes, Passing Arguments To A Function, Return Values And Their Types ,Category Of Functions, Recursion, Storage Classes: Automatic Variables, External, Variables, Static Variables, Register Variable	10
3	**Arrays**: Defining An Array, Processing An Array, Multidimensional Arrays, Array Operations. Strings: Puts, Gets Function, One Dimensional Character Array, Array Of Strings, Passing 1-d And 2-d Arrays To Functions, String Handling Without Using String Functions.	8
4	**Pointers**: Fundamentals, Pointer Declarations, Operations On Pointers, Passing Pointers To A Function, Pointers And One Dimensional Arrays, Pointers And Multidimensional Arrays, Array Of Pointers, Pointers And Strings, Multiple Indirection (Integers, Strings, Pointers To Pointers), Dynamic Memory Allocation (Malloc, Calloc, Realloc, Free). **Structures And Unions**: Defining A Structure, Processing A Structure, User Defined Data Types, Structure And Pointers, Passing Structure To Function, Self-referential Structures, And Union	10

5	**Data Files**: Opening And Closing A Data File, Reading And Writing A Data File, Processing A Data File, File Handling Functions, Formatted Input And Output Functions, File Processing Programs, Concept Of Binary Files. Additional Features Of C: Enumeration, Bitwise Operators, Command Line Parameters, Macros(Definition, Function Macros, Conditional Macros).	10

Text Books & References

1. Schaum's Outline Of Programming With C, Byron Gottfried 4rth Edition, Mcgraw-hill
2. Programming In Ansi C, E. Balagurusamy, Eighth Edition,Mcgraw Hill Education.
3. The C Programming Language, Brian W. Kernighan And Dennis M. Ritchie 2nd Edition, Prentice Hall Of India (2015).
4. Computer Basics And Programming In C, Rajaraman V, Phi
5. Understanding Pointers In C, Yashavant Kanetkar ,5th Edition, Bpb Publication (2009)
6. Programming In C, Pradip Dey, Manas Ghosh , 2nd Edition, Oxford Higher Education (2012)

Course Outcomes

On completion of the course, the student will be able

- Understand and apply fundamental concepts of C programming, to develop efficient programs.
- Implement control statements, looping structures, functions, and storage classes in C to develop efficient and structured programs.
- Design and implement arrays, to enhance data manipulation and program efficiency.
- Design programs using pointers and user defined data types
- Demonstrate the various file handling operations and use of advanced C features such as enumeration, bitwise operators, command-line parameters, and macros

Course Code	Course Title	Total Credits
MCACT104	**Computer Networking with TCP/IP**	**4**

Course Objectives

- To understand the functionality of a reference model for data communication.
- To understand the various protocols of different layers.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.
- Introduce the student to advanced networking concepts, preparing the student for entry to Advanced courses in computer networking

Module No.	Title & Contents	No. of Sessions
1	**Introduction to Computer Networks,Types of Networks:** LAN, MAN, WAN, PAN, Cloud Networks,Network Topologies,Network Devices: Hub, Switch, Router, Gateway, Access Point **Networking Models:** The OSI ref. Model, Layers in the OSI Model, TCP/IP protocol Suite, Comparison of the OSI and TCP/IP ref. Models, Addressing. **Physical Layer and functions**. **Data Link Layer:** Need for data link control, Framing, flow control - stop and wait, sliding window protocol, error detection - parity check, CRC, Error control - Stop and wait ARQ, Go back-N ARQ, Selective Repeat ARQ	9
2	**Wired LAN: IEEE** Standards-Frame Format-Addressing-Ethernet evolution. **Wireless LANS**: IEEE802.11, MAC Sub layer, Addressing Mechanism, Bluetooth-Architecture, Frame format **Network Layer:** Introduction, Switching-Circuit switching, Packet switching, connection oriented and connectionless service, services provided by network layer.	10
3	**Network layer protocols**- Network Layer: **IP addressing**, IPv4 Addresses-Introduction, Classful addressing, Classless addressing. IPv6 Addresses-Introduction, Address space Allocation. **Internet Protocol (IPv4)** Datagram format, Fragmentation, **IPv6**- Packet format. Transition from IPv4 to IPv6- Dual stack, Tunneling, Header translation. **Address mapping protocols**: **ARP**-Address Mapping, ARP Protocol, **DHCP -**Introduction, Configuration. **Error Reporting protocol**: ICMP-Introduction, Messages, **ICMPv6** Introduction, Error Messages**,** Information messages,Neighbour Discovery messages, Group Membership message. **Routing Protocols-** Introduction**,**Intra understand the operation of various protocol and Inter domain routing, distance vector routing algorithm, **RIP –** message format, RIP Timers, Link state Routing, **OSPF**-Areas, Types of Links, OSPF packets, Link	10

	state update packet, Path vector routing, **BGP –** external and Internal BGP , Types of packets	
4	**Transport Layer:** Services, Transport - layer protocol. **UDP:** User Datagram, UDP Services, And use of UDP.**TCP**: TCP Services, TCP features, TCP Segment Header, TCP Connection management, Flow Control, Error Control, TCP Congestion control, TCP timers.	10
5	**Application Layer: Domain Name System (DNS)** - Name space, DNS in the Internet, Resolution, DNS messages, Types of Records. **TELNET** -Time sharing Environment, Network virtual terminal, Embedding, options**, File Transfer Protocol(FTP)** -Connection, Communication, Command Processing, File transfer, Anonymous FTP**,** **World Wide Web**-Architecture, Web documents, **HTTP--** HTTP transaction, Message formats, Persistent and Non persistent connection. **Electronic Mail**: - Architecture, User Agent, Message Transfer Agent (SMTP), Message Access Agent: POP, IMAP. Web-based mail. **Network Security Basics**- Firewalls,VPN concepts,HTTPS basics	9

Text Books & References

1. Data and Computer Communications – William Stallings, Eighth Edition.
2. Behrouz A. Forouzan - Data Communications and Networking- Fourth Edition- Tata McGraw Hill.
3. Behrouz A. Forouzan – TCP/IP Protocol Suite- Fourth Edition- Tata McGraw Hill.
4. Andrew S Tanenbaum- Computer Networks – Third Edition- PHI.

Course Outcomes

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

- Compare and Evaluate network reference models and differentiate physical and data link layer protocols.
- Analyze LANs and Switched WANs and examine the Network Layer services.
- Evaluate the addressing mechanisms of the Network Layer and differentiate the network layer protocols.
- Discuss the Transport Layer services and implement the protocols
- Apply knowledge of application layer protocols to configure network services.

Course Code	Course Title	Total Credits
MCACT105	**Operating System**	**4**

Course Objective

- To understand different types and structures of Operating systems and different process scheduling techniques .
- To analyze and manage processes, CPU scheduling algorithms, and synchronization mechanisms for efficient system performance.
- To identify, prevent, and handle deadlocks in multiprogramming environments.
- To understand and implement concepts of memory management ,virtual memory techniques and file management systems.
- To study and compare real-world operating systems through case studies of Desktop OS (Linux & Windows) and Mobile OS (Android & iOS).

Module No	Title & Contents	No. of Sessions
1	**Operating Systems Overview**: Definition. Functions, Types of operating systems -Batch Operating System, Multi programming-Time sharing, Real time, distributed operating systems. **Operating Systems Structures**:- Systems Components, Operating System Services, System Calls, System Programs, System Structure, Virtual Machines **Process Management**:-Job and process concept, Operating system view of processes, process-state transition diagram, PCB Process Scheduling:-Types of schedulers, scheduling and performance criteria, scheduling algorithms, multiple processor Scheduling, Thread Overview and its benefits	10
2	**CPU Scheduling and Synchronization** - Basic Concepts, Scheduling Criteria , Scheduling Algorithms Synchronization- critical section problem, mutual exclusion-mutual exclusion algorithms, semaphores-definition; busy wait implementation, monitors, Classic Problems of Synchronization **Deadlocks:** Definition –Deadlock characterization-Resource allocation graph, methods for handling deadlocks, deadlock prevention, deadlock avoidance-safe state-resource allocation, graph algorithm, Banker's algorithm, deadlock detection, recovery from deadlock.	10
3	**Memory management**:-Address binding, dynamic linking and loading, Overlays,Logical versus physical address space,Swapping,Contiguous	

	Memory Allocation **Paging** - basic method, Hardware Support , Protection , Structure of the page table -hierarchical paging, shared pages. Segmentation - basic method,Hardware, Protection, Fragmentation , Segmentation with Paging	10
4	**Virtual Memory**:-Demand paging –performance. Page replacement-page replacement algorithms, Allocation of Frames, Thrashing, **Mass Storage Structure**:- Disk structure, Disk scheduling-FCFS-SSTF-C-Scan-Look, Disk management	8
5	**File Management**: Introduction, FileAttributes, File Operations,File Types, Access Methods, Directory Structure,File system implementation, Allocation methods **Introduction to Distributed Systems** **Case Study - Desktop OS - Linux & Windows, Mobile OS – Android and iOS**	10

Text Books & References

1. Abraham Silberschatz and Peter Baer Galvin,Greg Gange ‘Operating System Concepts’, (Sixth Edition) Wiley - India.
2. Milan Milenkovic ‘Operating systems’ TATA Mc GrawHill.
3. Andrew S. Tanenbaum, “Modern Operating System”, Prentice Hall India
4. Learning Android OS – Oreilly Publishers
5. Learning iOS – Oreilly Publishers

Course Outcomes

- Explain the fundamental concepts, structures, and services of operating systems, including process management, process scheduling, and different types of operating systems.
- Apply CPU scheduling algorithms and synchronization mechanisms to solve critical section problems and analyze deadlock detection, prevention, avoidance, and recovery techniques
- Analyze memory management techniques including paging, segmentation, contiguous allocation, and advanced page table structures for efficient resource utilization.
- Evaluate virtual memory management strategies, page replacement algorithms, disk scheduling techniques, and mass storage management mechanisms for system performance optimization
- Describe file system structures, allocation methods, and distributed system basics, and compare the architecture and features of Desktop Operating Systems (Linux & Windows) and Mobile Operating Systems (Android & iOS)

Course Code	Course Title	Total Credits
MCACP106	**Database Technology Lab (Mysql & Mongodb)**	**2**

Course Objectives

This course aims to:

1. Provide an introduction to MySQL and MongoDB, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.
2. Introduces queries to insert data, update, delete and fetch the data from the tables.
3. Describe merging of tables using aggregate functions, nested queries, clauses to filter and sort the data, has been covered in detail.

Module No.	Title & Contents	No. of Sessions
1	**Introduction :** Basic database concepts.DBMS vs file system (overview),Introduction to relational databases,ER Model **Building a database: Table by table** a) Table creation with constraints(primary key, referential integrity constraints, not null) b) Create Index. c) Drop table. d) Display a table's structure. e) Listing all tables. f) Altering the table structure.	6
2	**Data manipulation language (DML) commands** Row insertion, deletion and updating. **Basic SELECT statements** a) Simple select query b) Using arithmetic operators in SQL statements c) Selecting rows with conditional restrictions (>,<, =, <>, >=, <=, BETWEEN, IN, LIKE, IS NULL / IS NOT NULL) d) SELECT with Logical Operators (AND, OR and NOT). **Advanced SELECT Statements** a) Sorting Data - ORDER BY clause b) Listing Unique Values – DISTINCT c) Aggregate Functions – COUNT, MIN ,MAX SUM ,AVG d) SELECT with GROUP BY & HAVING clause.	14
3	**Joining database tables & SQL Functions** **a) Joining Tables** ● Joining tables with an alias.	13

	• Cross Join • Natural Join • Join USING • Join ON • The Outer Join (LEFT OUTER JOIN, RIGHT OUTER JOIN) **b) SQL Functions** • Date and Time Functions (MONTH, DAYOFMONTH , YEAR, DATEDIFF, DATE_ADD and DATE_SUB, LAST_DAY) • Numeric Functions(ABS, ROUND, TRUNCATE, MOD) • String Functions(CONCAT, UPPER/LOWER, SUBSTR, LENGTH) **c) Subqueries** d) **Create & Drop View.** **Normalisation (1NF,2NF,3NF,BCNF) ,PL/SQL , Stored Procedure,Transactions,Transaction Properties**	
4	**NoSQL – MongoDB** a) Create & Drop database in Mongodb, b) Create collection and Drop collection, c) Insert, Find, and Update & Delete documents. d) Find with Projection, e) Sorting, Indexing & Create Backup	9
5	**Project** Development of sample database using MySQL i. Student Information System ii. Bank Transaction iii. Library Information System etc.	6

**** Lab manual is attached as Annexure 1***

Text Books & References

1. Mysql: The Complete Reference by VASWANI, McGraw Hill publication.1st edition, 2017
2. MongoDb: The Definitive Guide, Second Edition by Kristina Chodorow, O'Reilly Media publication; Second edition (June 4, 2013)
3. MySQL Explained: Your Step By Step Guide to Database Design by Mr. Andrew Comeau, CreateSpace Independent Publishing Platform; 2 edition (November 22, 2017).

Course Outcomes

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

- Create and alter table structures using MySQL.
- Formulate queries to perform DML operations, select and rollback in a database.
- Design and implement tables using join ,sql functions and views,Build subqueries to extract rows from processed data.
- Create and manipulate collections in Mongodb and perform various operations.
- Design and implement a database for a given problem domain.

Course Code	Course Title	Total Credits
MCACP107	**Software Development Lab- I(C programming)**	**2**

Course Objectives

This course aims to:

- Understand the basic concepts of C programming.
- Practice the use of conditional and looping statements.
- Implement arrays, functions and pointers.
- Gain skills to handle strings and files.

Module No.	Title & Contents	No. of Sessions
1	**Data Types, Conditional Statements and Loops** ● Familiarization of data input/output and operators in C ● Demonstration of Data type conversion (Hint: Usage of type casting). ● Implementation of various Storage Types. ● Demonstration of various loops. ● Demonstration of nested if (Hint: Use logical operators). ● Demonstration of switch... case structure..	6
2	**Arrays , Recursion and pointers** ● Implementation of arrays.(One dimensional & two dimensional) ● Implementation of functions (Hint: Demonstrate call by value, call by schemes, passing of arrays). ● Demonstration of various string operations (Hint: Usage of user defined functions) ● Demonstration of recursion. ● Demonstration of debugging pointer errors. ● Demonstration of indirection operations using pointers	14
3	**Structures and Unions** ● Implementation of structures (Hint: simple structure operations, array of structures). ● Implementation of Union. ● Implementation of pointers to structures and unions. ● Demonstration of dynamic allocation of memory (Hint: malloc, calloc, realloc, free)..	13
4	**Sorting , Searching and File Handling** ● Demonstration of sorting techniques (Hint: selection sort, bubble sort). ● Demonstration of searching techniques (Hint: linear search, binary search). ● Demonstration of bitwise operations. ● Demonstration of macro processing.	9

	• Demonstration of various file operations. (Hint: Text file) • Implementation of character counting, line counting and word counting for a file.	
5	**Project** Development of a Sample project	6

**** Lab manual is attached as Annexure 2***

Text Books & References

1. Schaum's Outline of Programming With C, Byron Gottfried 4rth Edition, Mcgraw-Hill
2. Programming In Ansi C, E. Balagurusamy, Eighth Edition,Mcgraw Hill Education.
3. The C Programming Language, Brian W. Kernighan And Dennis M. Ritchie 2nd Edition, Prentice Hall Of India (2015)

Course Outcomes

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

- Demonstrate the use of various iterative and decision making statements
- Design programs using arrays, strings , functions, recursion and pointers
- Develop programs to demonstrate the use of structure, union , pointer to structure and dynamic memory allocation functions
- Demonstrate various searching and sorting algorithms, use of bitwise operators, various file operations and manipulations on data in files
- Demonstrate the ability to solve real-world problems by applying the knowledge of data structures and programming concepts to design, develop, and implement a sample project

Course Code	Course Title	Total Credits
MCACT 108	**Employability Skill Training-Phase 1**	**1**

Course Objectives

- Enable students to identify their strengths and weaknesses.
- Measure each student's numerical ability, problem solving and mathematical skills.
- Enhance aptitude and reasoning ability of students that will make them capable of securing a job with any recruiter.
- Guide students in Resume making.

Module No.	Title & Contents	No. of Sessions
1	**Motivation And Goal Setting** Motivation, Assertiveness, Career Exploration and Life Planning, Goal Setting, Time Management, Stress Management. **Activity:** Must Read *(Institution option possible)* 1. Karmayogi: A Biography of E. Sreedharan by M. S. Ashokan	2

	2. The 7 Habits of Highly Effective People – Stephen R. Covey 3. The Leader Who Had No Title - Robin Sharma	
2	**Arithmetical And Verbal Reasoning Ability:** Problems on Numbers, Problems on Ages, Percentage, Ratio and Proportion, Time and Work, Time and Distance, Problems on Trains, Boats and Streams, Alligation or Mixture, Area, Average, Races and Games of Skill, Calendar, Clocks, Banker's Discount, Decimal Fractions, Heights and Distance, Odd Man Out and Series. Types of verbal reasoning, Analogy, Series Completion, Coding and Decoding, Blood Relation, Puzzle Tests, Direction Sense Test, Venn Diagrams, Logical Sequence of Words, Syllogism, Cause and Effect, Dice, Cube and Cuboid, Seating Arrangement. **Activity:** Company wise sample Questions, Mock Test on Each Topic.	3
3	**Data Interpretation & Logical Reasoning** Tabulation, Bar Graphs, Pie Charts, Line Graphs. **Activity:** Company wise sample Questions, Mock Test on Each Topic.	3
4	**ENGLISH APTITUDE** Fill in the blanks, Comprehension, Phrases and Sentences, Sequencing, Basic Grammar, Synonyms and Antonyms, technical Vocabulary, Common Errors. **Activity:** Practice Sets.	3
5	**RESUME PREPARATION** Resume Tips, Cover Letter, Sample Resume, Help for making a perfect Resume, Job Application Letters, E-mail messages. **Activity: Individual Resume Evaluation**	2

Note : 50% of the syllabus is intended to cover in online / activity mode

Text Book & References

1. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata McGraw Hill Education Private Limited.
2. Aggarwal, R. S., *Quantitative Aptitude for Competitive Examinations*, New Delhi, S. Chand and Company Pvt. Ltd.
3. Aggarwal, R. S., *Modern Approach to Verbal n Nonverbal Reasoning*, New Delhi, S. Chand and Company Pvt. Ltd.
4. **https://www.campusgate.co.in/**
5. **http://www.allindiaexams.in/reasoning/verbal-reasoning-questions-answers**
6. **https://www.sawaal.com/aptitude-reasoning-questions-and-answers.html**
7. **https://www.indiabix.com/logical-reasoning/questions-and-an swers/**

Course Outcomes

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

- Formulate a comprehensive personal development plan that includes specific goals, motivation strategies, and time management techniques.
- Solve a variety of arithmetic and verbal reasoning problems in mock assessments to demonstrate understanding and application of the concepts learned.

- Analyze and interpret data from different graphical representations to draw meaningful conclusions and insights applicable to real-world scenarios.
- Compose a clear and coherent written response that demonstrates proper use of grammar and vocabulary, addressing a specific prompt.
- Develop a tailored resume and covering letter for a specific job application that effectively showcases skills, experiences, and personal branding.

Course Content -Semester 2

Course Code	Course Title	No of hours per week		Continuous Evaluation (Marks)	Summative Evaluation (Marks)	Total Marks	No. of Credits
		L	P				
MCACT201	Optimization Techniques for Computer Applications	**4**	**-**	**25**	**75**	**100**	**4**
MCACT202	Data structures and Algorithm Analysis	**4**	**-**	**25**	**75**	**100**	**4**
MCACT203	Software Engineering & Object Oriented modeling	**4**	**-**	**25**	**75**	**100**	**4**
MCA204ET	Elective 1	**4**	**-**	**25**	**75**	**100**	**4**
MCACP205	Object oriented Lab(Java Lab)	**-**	**6**	**25**	**75**	**100**	**3**
MCACP206	Software development lab-II (PHP & React))	**-**	**4**	**25**	**75**	**100**	**2**
MCACP207	Advance Operating System Lab using Linux	**-**	**4**	**25**	**75**	**100**	**2**
Total		**16**	**14**			**700**	**23**

Elective 1	
MCA204ET1	Artificial Intelligence
MCA204ET2	Enterprise Resource Planning
MCA204ET3	Computer Graphics And Multimedia
MCA204ET4	Digital Image Processing

Course Code	Course Title	Total Credits
MCACT201	**Optimization Techniques for Computer Applications**	**4**

Course Objectives

- To Familiarize participants with the scope and applications of Operations Research
- To impart basic insights to students about use of various Scientific Tools and Models in Operations Research
- To provide basic insights into different applications in Operations Research

Module No.	Title & Contents	No. of Sessions
1	**Introduction to OR**-The origin and development of OR, Nature and uses of OR, Modelling in OR **Introduction to Linear Programming**-Mathematical formulation of Linear Programming Problem, Graphical solution, special cases of graphical method	7
2	**Solving LPP-The simplex method**-slack and surplus variables, the simplex method ,special cases in simplex method **Artificial variable**-use of artificial variable, Big M method **Duality in LPP**, Dual-simplex method.	12
3	**Transportation Problem**-Introduction, The transportation Table, Loops in Transportation Table, Solutions of Transportation Problem, Finding an initial basic feasible solution, Degeneracy in T.P, MODI method, maximization in T.P **Assignment Problem**-Introduction, Hungarian method, maximization in Assignment Problem. The Travelling Salesman problem.	10
4	**Game Theory**- basic terms, Two-person zero sum game, saddle point, strategy, games with saddle point, maximin - minimax principle, games without saddle point-mixed strategy, arithmetic method , graphical method for 2*n and m*2 games, Dominance principle-solving m*n game **Queueing Theory**-queueing system, elements of queueing system, characteristics of queueing system, classification of queueing models, problems of model1 only.	9
5	**Networking analysis**- introduction, basic terms, rules of network construction, Critical Path Method(CPM), Programme Evaluation and Review Technique(PERT). **Simulation**-simulation concepts, basic ideas of Monte-Carlo simulation. **Sequencing-** models-basic terms, processing n jobs through 2 machines,	10

	processing n jobs through 3 machines.	

Text Books & References

1. Operations Research: Kanti Swarup, P.K Gupta and Man Mohan,14 th edition
2. Operations Research: S Kalavathy, 2nd edition.
3. Operations Research: Hillier, Liberman
4. Operations Research: An Introduction: Taha H.A

Course Outcomes

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

- Demonstrate Operations Research (OR) models and their applications, formulate real-world problems as Linear Programming Problems (LPPs), and analyze & solve them using graphical methods.
- Formulate and solve Linear Programming Problems (LPPs) using the Simplex method, and analyze problems using duality and the Dual-Simplex method.
- Describe Transportation and Assignment Problems, formulate and solve them using appropriate methods, and apply optimization techniques for the Travelling Salesman Problem (TSP).
- Explain fundamental concepts of Game Theory and Queueing Theory, analyze and solve game problems, and apply Queueing Theory models to real-world scenarios.
- Explain the fundamental concepts of Network Analysis, Simulation, and Sequencing, apply techniques like CPM and PERT for project management, demonstrate Monte-Carlo simulation concepts, and solve sequencing problems.

Course Code	Course Title	Total Credits
MCACT202	**Data structures and Algorithm Analysis**	**4**

Course Objectives

- To impart the basic concepts of data structures, algorithms and the analysis phase of algorithms.
- To Understand basic concepts, implementation and applications of stacks, queues, lists, trees and graphs ·
- To understand concepts about searching and sorting techniques.
- To choose the appropriate data structures for a specified real life application.

Module No.	Title & Contents	No. of Sessions
1	**Introduction:** Data Structures, Concepts of Data Structures, Implementation of Data Structures. **Algorithms:** Definition,Performance analysis– Space complexity, Time complexity, Asymptotic notation, Practical Complexities, Performance Measurement. **Arrays:** Ordered lists – representation of array, polynomial addition. Demonstrate polynomial addition.	5
2	**Stacks and Queues:** Definition and concepts, Operations on stacks. Application of stacks- Evaluation of arithmetic expression,.infix to postfix conversion, evaluation of postfix expressions. **Queue:-** representation of queue, Operations on queue, Circular queue , implementation of stack, queue,circular queue, Conversion of an infix expression to postfix expression and its evaluation	10
3	**Linked List** - Singly linked list- Insertion, deletion, traversing and searching. Linked stacks and queues **Doubly linked list-** Insertion, deletion, Traverse and Search operations. Implementation of linked list, linked stack, linked queue, doubly linked list	8
4	**Trees :** Basic terminology, binary trees, binary tree representation, algebraic expressions, binary tree traversals, Binary Search Tree –Insertion and Searching, **Hashing:** Hashing Concept, Hash functions, Collision Resolution- **Searching and Sorting:** Searching – Linear search, Binary search, Comparison of both methods. Sorting – Insertion, Selection Sort	10

5	1. Implement polynomial addition using Arrays. 2. Implement the Stack data structure 3. Implement the Queue data structure 4. Implement the Linked list data structure along with its operations. 5. Implement Stack & Queues using Linked lists. 6. Implement Sorting techniques. 7. Case study: Implement a real-world application (e.g., student record management or library management system) using appropriate data structures.	15

Text Books & References

1. Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia , 1994)
2. Data Structures (Schaum's Outline Series) by Lipschutz Seymour, Tata Mcgraw-hill
3. Classic data structures – D Samanta, 2 Edn. (PHI, 2009).
4. Data Structures – a pseudocode approach with C –Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn., Cengage Learning C 2005
5. Data Structures Through C in Depth, S.K. Srivastava, Deepali Srivastava, (BPB Publications, 2003).

Course Outcomes

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

- Understand fundamental data structures, performance analysis and design algorithms using arrays
- Design algorithms to implement linear data structures using Arrays.
- Develop the ability to implement singly and doubly linked lists and to apply linked representation to implement stacks and queues.
- Understand and apply trees, hashing, and basic searching and sorting techniques for efficient data handling.
- Develop practical skills to implement and select appropriate data structures for specific applications, along with basic searching and sorting using arrays and linked lists.

Course Code	Course Title	Total Credits
MCACT203	**Software Engineering and Object Oriented Modeling**	**4**

Course Objectives

- To Familiarize students with the need and importance of software engineering.
- To impart basic insights to students about various activities in different phases of software engineering.
- To provide knowledge in modeling tools.

Module No.	Title & Contents	No. of Sessions
1	**Introduction to Software Engineering:** Definition and characteristics of software, Broad categories of computer software, Software Myths. **The Software process:** Software engineering layers, A process framework (five generic process framework and umbrella activities), Software product and software process. **Process Models:** Definition, Waterfall model, Evolutionary models (Prototyping and Spiral models.) **Agile view of process:** Agile process, Human factors in agile models, Agile Process models -(Extreme programming and Scrum).	10
2	**Requirements engineering**:-Requirements engineering tasks, Initializing requirements engineering process, Types of requirements, Feasibility studies. **Eliciting requirements**:- Interviews, brain storming, FAST, QFD, Use case approach. **Requirement Analysis:-** Steps in requirement analysis, DFD, Data Dictionary, ER diagrams, prototyping, **Requirement documentation and review**:- Nature of SRS, Characteristics of good SRS, Organization of an SRS-IEEE standard format for SRS(basics only), the requirements review process.	10
3	**Software Design:** conceptual and technical design, design objectives, importance of design, Modularity (module coupling, module cohesion, relationship between coupling and cohesion), Strategy of design, Function oriented design, Object oriented design(steps to analyze and design object oriented systems.)	9
4	**Software Testing**: strategic approach: verification and validation, criteria for completion of testing. **Test strategies for conventional software**:-unit testing, integration testing(Regression testing, smoke testing.), validation testing, system testing(recovery, security, stress, performance). Testing Tactics:- Black box and White box testing, Blackbox- equivalence partitioning, White box-Basis path testing(flow graph notation, deriving test cases)	9

5	**Object Oriented Modeling** **Use Case**: Actors Scenarios & Use cases, drawing Use Case Diagrams, three common use case formats, The system sequence diagram **UML Interaction diagrams** :- sequence and communication diagrams, sequence vs communication diagram, Basic sequence diagram notation, Basic communication diagram notation. **Class diagrams**:-introduction, common class diagram notation. **Activity Diagrams and Modeling**: - Introduction, example, basic activity diagram notation.	10

Text Books & References

1. Software Engineering A Practitioner's Approach, Roger S Pressman, McGrawhill International Edition, Sixth Edition.[Unit 1 and 4]
2. Software Engineering, K K Agarwal and Yogesh Singh, New age international, Third Edition[Unit 2 and 3]
3. Applying UML and Patterns, Craig Larman, Pearson, Third Edition[Unit 5]
4. Object Oriented modeling and Design with UML, Michael Blaha, James Rumbaugh, Person, second edition.
5. Ian Sommerville, Software Engineering VII th Edition Pearson Education
6. Pankaj Jalote, An Integrated approach to Software Engineering,Narosa Publishing Company, Second Edition.Pearson Education

Course Outcomes

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

- Define software, software engineering and compare and review process models.
- Identify software requirements engineering activities and develop SRS.
- Interpret and use different design strategies and develop SDS.
- Identify different testing strategies and develop test cases for testing the software.
- Build analysis and design models for various applications using UML diagrams.

Course Code	Course Title	Total Credits
MCA204ET1	**Artificial Intelligence**	**4**

Course Objectives

The course aims to :

- Get insights into the basic knowledge of Artificial Intelligence, AI application along with its importance.
- Be familiar with problem representation in symbolic notation.
- Able to understand the algorithmic approach in machine learning and automation
- Analyze the matching techniques for organizing and manipulating knowledge. Predict pattern based on Reasoning.
- Acquire basic knowledge in various fields of AI.

Module No.	Title & Contents	No. of Sessions
1	**AI Introduction and History**: Defining AI, Acting Humanly (Turing Test Approach), Thinking Humanly(Cognitive Modeling Approach), Thinking Rationally (laws of thought approach), Acting Rationally(Rational Agent Approach); Foundations of Artificial Intelligence. History of AI. AI Problems, Assumptions, Techniques, Level of Model, and Criteria for success. Problems, Problem spaces and Search - Problem Definition, Production systems, Problem characteristics, Production system characteristics.	10
2	**Searching Problems:** Knowledge Organization and Management - Search and Control Strategies - Examples of search problem, Uniformed or Blind search, Informed search, Searching AND-OR graphs. Matching Techniques -Structures used for matching, Measures for Matching, Matching like patterns, Fuzzy matching algorithm	8
3	**Knowledge Representation Schemes :** Formalized Symbolic Logics - Syntax and Semantics of Propositional and Predicate logic, Properties of WFFS, Inference rules, Resolution, Non- Deductive Inference Method. Inconsistencies and Uncertainties – Non- monotonic reasoning, Truth Maintenance system, Default reasoning and the closed world assumption. Structured Knowledge - Associative Networks	11
4	**Knowledge Acquisition** : General Concepts in Knowledge Acquisition - Types of learning, Difficulty in Knowledge Acquisition, General learning model, Performance measures. Early work in Machine Learning – Perceptron, Genetic algorithms, Intelligent editors. Analogical and Explanation Based Learning – Analogical Reasoning and learning, Examples, Explanation based learning.	9

5	**Natural Language Processing** - Overview of Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic Analysis and Representation structures, Natural Language generation, Natural language systems. **Experts system Architectures** :Rule-based system, Non production system, Dealing with uncertainty **Robotics:** Definitions, Connections between robotics and some related subjects: Artificial intelligence Flexible manufacturing systems, factory automation, computer-aided manufacturing	10

Text Books and References

1. Stuart Russel and Peter Norvig: Artificial Intelligence – A Modern Approach, 2nd Edition Pearson Education
2. Elaine Rich and Kevin Knight: Artificial Intelligence, Tata McGraw Hill 2nd Ed. N.P. padhy
3. Introduction to Artificial intelligence and expert systems by Dan W. Patterson, Prentice Hall India
4. Fundamentals of Robot Technology- An Introduction to Industrial Robots, Tele operators and Robot Vehicles D J Todd

Course Outcomes

- Discuss the core concepts, history, and approaches of AI, along with AI problem-solving techniques and the features of production systems and search strategies.
- Evaluate search problem techniques, including search strategies and matching methods, by assessing their structures, measures, and fuzzy matching algorithms.
- Evaluate and apply knowledge representation schemes, including symbolic logics, inference rules, non-deductive methods, non-monotonic reasoning, and structured knowledge through associative networks.
- Analyze knowledge acquisition concepts, including types of learning, machine learning techniques, analogical reasoning, and explanation-based learning.
- Discuss the fundamentals of NLP, expert systems, and robotics, focusing on parsing, semantic analysis, rule-based systems, and AI in manufacturing.

Course Code	Course Title	Total Credits
MCA204ET2	**Enterprise Resource Planning**	**4**

Course Objectives

- To build an understanding of the fundamental concepts of ERP systems and their architecture
- To familiarize the working of different modules, technologies and implementation and post implementation activities in ERP.
- To understand the present trends and future developments in the field of Enterprise resource planning.

Module No.	Title & Contents	No. of Sessions

1	**Introduction to ERP:** Need for ERP, History of ERP, Justifying ERP Investment, Risks and Benefits of ERP, ERP-The Indian scenario, ERP Vendors	8
2	**ERP Business modules and Related technologies:** ERP Business modules-Financial, Manufacturing, HR Management, Plant Maintenance, Material Management, Quality Management, Marketing, Sales, Distribution and other services. Related Technologies-Business Intelligence and Business Analytics - E-commerce and E-Business, Business Process Reengineering (BPR), Data Warehousing (DW) and Data Mining (DM), Online Analytical Processing (OLAP), Geographical Information System (GIS).	12
3	**ERP Implementation:** Implementation challenges, ERP Implementation strategies, ERP Implementation life cycle, Implementation methodologies, ERP deployment methods.	8
4	**ERP Post Implementation:** Post-Implementation Activities, Employees and Employee resistance, Contracts with vendors-consultants-Employees, Trainings and Education, Data Migration, Project Management and Monitoring, Success and Failure factors of an ERP Implementation.	10
5	**ERP Present and Future:** ERP for Manufacturing Industries - ERP for Service Industries - Enterprise Application Integration (EAI) - ERP and Total Quality Management (TQM) - Future Directions and trends in ERP. ERP and security. Case Studies - Mysap Business solution implementation at ITC - Nestle Global Project - Oracle ERP implementation at Maruti Suzuki.	10

Text Books & References

1. Rajesh Ray, Enterprise Resource Planning, McGraw Hill Education (India) Pvt Ltd.
2. Alexis Leon, ERP Demystified, McGraw Hill Education (India) Pvt Ltd., Third edition.
3. Alexis Leon, Enterprise Resource Planning, McGraw Hill Education (India) Pvt Ltd., Fourth edition.
4. ERP and Supply Chain Management by Christian N. Madu, Publisher: CHI

Course Outcomes

At the end of the course the student should be able to

- To build an understanding of the fundamental concepts of ERP systems, their architecture, and working of different modules in ERP.
- Students will also be able to understand different technologies used for building ERP systems and different business modules associated with ERP systems.
- To make the student aware about ERP implementation life cycle, methodologies and deployment methods.
- To make the student aware about the post implementation activities of an ERP project.
- Students will be able to understand the future directions, trends and possible security issues of ERP.

Course Code	Course Title	Total Credits
MCA204ET3	**Computer Graphics and Multimedia**	**4**

Course Objectives

1. To introduce the use of the components of a graphics system and become familiar with building the approach of graphics system components and algorithms related with them.
2. To learn the basic principles of 3- dimensional computer graphics.
3. Provide an understanding of how to scan convert the basic geometrical primitives.
4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
5. To be able to discuss the application of computer graphics and Multimedia.
6. To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles.

Module No.	Title & Contents	No. of Sessions
1	Introduction to graphics, Practical applications of computer graphics, Video Display Devices- Random Scan Display, Raster Scan Display , Three Dimensional Viewing Devices, Stereoscopic and Virtual-Reality Systems. Frame buffer. Color and Grey scale model.	8
2	Basic raster graphics algorithms-Points and lines: DDA and Bresenham's line drawing algorithm, Midpoint Circle and DDA circle algorithm. Two dimensional transformations: translation, rotation, scaling, reflection and Shear. Matrix representations and homogeneous coordinates, composite transformations.	10
3	Window to viewport transformation , Filling- Boundary Fill , Flood Fill, Clipping operations- Point, Line- Cohen Sutherland Line Clipping Algorithm, Polygon, Text clippings.. Three dimensional geometric transformations- Translation, Scaling, Rotation. 3D viewing -Parallel, Perspective projections, Visible surface detection algorithms – Back Face Detection, Depth buffer method, A-buffer method. Surface Rendering-light sources, shading methods.	12
4	Multimedia-Introduction, Multimedia Presentation and Production, Characteristics, Hardware and Software requirements, Uses of Multimedia, Analog Representation, Digital Representation , Sampling Rate, Bit Depth, Quantization Error. Text-Types, font , Text Compression, File Formats, Image-Types, Color Models, Steps in image processing, File Formats.	9
5	Audio – Basic sound concept,MIDI ,Speech, Video and Animation- Basic Concepts,Computer –based Animation. Data Compression – JPEG, MPEG , DVI.	9

Text Books & References

1. Hearn D,Baker ,*Computer Graphics)*, 2e,Prentice- Hall of India 2006.
2. Ranjan Parekh, "Principles of Multimedia",2e, Tata McgrawHill,2014
3. Ralf Steinmetz and Klara Nahrstedt, "Multimedia Computing, Communications & applications", Pearson ,7e, 2014

4. Foley, Vandam, Feiner, Huges,"Computer Graphics: Principles & Practice", Second edition in C, Pearson Education, 2005
5. Ranjan Parekh, "Principles of Multimedia", ,Tata McgrawHill,2006
6. D.P. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.
7. Hill Jr, "Computer Graphics using openGL",2nd Edition,PHI
8. Nigel Chapman & Jenny Chapman, "Digital Multimedia", Wiley Publications.
9. Ralf Steinmetz and Klara Nahrstedt, "Multimedia Systems", Springer,2004
10. Tay Vaughan, "Multimedia: Making it work", Seventh Edition, Tata McGraw-Hill Publishing company Ltd, 2007
11. Fred Halsall, "Multimedia Communication-Application Networks, Protocols and Standard", Addison-Wesley, 2001.

Course Outcomes

At the end of the course, the student should be able to

- Understand and reproduce the core concepts of Computer Graphics and Multimedia
- Develop the competency to understand the concepts related to rendering.
- Apply mathematics and logic to visualize Computer programs for elementary graphic operations
- Compile different Graphic and Multimedia formats
- Summarize the different application of Computer Graphics and Multimedia

Course Code	Course Title	Total Credits
MCA204ET4	**Digital Image Processing**	**4**

Course Objectives

- To familiarize students with an overview of the basic concepts of Digital Image Processing
- To understand the processes of improving the quality of an image
- To familiarize the students about the concept of slicing a digital image
- To expose the students towards real-world applications of image processing

Module No.	Title & Contents	No. of Sessions
1	**Introduction to Image Processing** –Nature of Image Processing, Image Processing and Related Fields, Digital Image Representation, Types of Images, Fundamental Steps in Image Processing, Image Processing Applications, Digital Imaging System, **Physical Aspects of Image Acquisition** – Biological Aspects of Image Acquisition, Review of Digital Camera, Sampling and Quantization, Image Quality, Image Storage and File Formats	8

2	**Digital Image Processing Operations** –Levels of Image Processing, Basic Relationship between pixels and Distance Metrices, Classification of Image Processing Operation – Arithmetic and Logic, **Geometrical Operations** – Translate, Scaling, Zooming, Linear Interpolation, Shearing, Rotation, Reflection, Set Operation, Data Structure and Image Processing Application, **Digital Image Transforms** – Need for Image Transforms, Types of Image Transforms, introduction to Fourier Transforms, Properties of Fourier Transforms	8
3	**Image Enhancement and Restoration** – Image Quality and Need for Image Enhancement, Image Enhancement Point Operations – Linear and Non-Linear Functions – Intensity Slicing, Bit-plane Slicing, Histogram based techniques, **Spatial Filtering Concept** – Smoothing and Sharpening Filters, Frequency Domain – Smoothing and Sharpening Filters, **Image Degradation** (Restoration Model) –Categories of Image Degradation, **Color Image Processing-**,fundamental, Color Models – RGB, HSI,HLS, HSV **T V color Models**-, YUV Model, YIQ Model	12
4	**Image Segmentation and Compression** – Introduction, Classification of Image Segmentation Algorithms,, Detection of Discontinuities – Point Detection, Edge Detection, Thresholding , Principle of Region Growing, Split and Merge, Pyramid Quadtree, **Image Compression** – Fundamentals, Compression Models, Error free Compression – Variable Length Coding, Lossy Predictive Coding, **Image Compression Standards** – JPEG, MPEG	12
5	**Image Morphology** –introduction, Dilation and Erosion, Opening and Closing, Hit and Miss Transform, Basic Morphological Algorithms, **Image feature** Representation and Description – Introduction, Boundary Representation, Boundary Description, Biometrics Case Studies	8

Text Books & References:

1. Rafael.C.Gonzalez & Richard E.Woods, Digital Image Processing, Pearson Education
2. S. Sridhar, Digital Image Processing, Oxford Publisher.

Course Outcomes

After the completion of this course, students will be familiar with:

- An overview of Digital Image Processing
- Acquire knowledge about large processing operation and transformations
- Understanding the concept of enhancing the quality of an image for analysis
- Adopts algorithmic approach to illustrate image processing

Course Code	Course Title	Total Credits
MCACP205	**Object oriented Lab(Java Lab)**	**3**

Course Objectives

The course aims to:

- Familiarize students with the scope and applications of object oriented concepts and techniques.
- Create Java application programs using exceptions, threads and interfaces.
- Learn database connectivity through API programming.
- Develop GUI applications to analyse the real world problems.

Module No.	Title & Contents	No. of Sessions
1	**Basics of Java:** Programming concepts, Array implementation, Strings, Reading input from keyboard **Introduction to Object Oriented Programming concepts :** Classes, Methods, Constructors, access specifiers, Encapsulation, Polymorphism, Method & constructor overloading, Inheritance and its different types, super keyword, abstraction through abstract classes.	17
2	**Interfaces and Packages**- Built in and user defined packages, access protection in packages **Exception handling**- basic concepts, types of exception, user defined exception **Multithreading Programming** - Defining threads, Life cycle, creating single and multiple threads, Thread priorities, Synchronization **File handling** - Built in methods, Reading , writing, copying and appending a file.	16
3	**Applets -** Basics, Life cycle, applet methods, applet tag, passing parameters to applet, adding image file to applet, **Working with Graphics, AWT Controls and Text** : Graphics programming, Color class, Font class, Font Metrics **Swings** - Introduction, Hierarchy of classes, Controls with event handling	18
4	**Layout Managers ,Menus** -Menubars, submenus, Dialog boxes, File Dialog **Database Connectivity** - JDBC overview, JDBC implementation & its architecture, Establishing connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, Working with Result Set	11
5	**Networking**-Socket programming, TCP/IP, Datagram, Multicast **Developing a GUI application**	10

**** Lab manual is attached as Annexure 3***

Text Books & References

1. Java The Complete Reference , Herbert Schildt 7th Edition. Tata McGraw-Hill Edition
2. Object Oriented Programming With Java, E.Balagurusamy 5th Edition, McGraw-Hill Education

3. Core Java VolumeII -Advanced Features, Cay S Horstmann and Gary Cornell,9th Edition,Pearson
4. Java Networking Programming, Elliotte Rusty Harold, 4th Edition,O'REILLY
5. Core Java For beginners, Rashmi Kanta Das, Revised Edition, Vikas Publishing House Pvt.Ltd
6. Programming with Java, Dr.T.V Suresh Kumar, Dr,B.Eswara Reddy, Raghavan P,First Edition Pearson
7. Introduction to Object Oriented Programming through Java, First Edition, ISRD Group, TataMcGraw Hill
8. A Text book on Object Oriented Design and Programming using Java, Divya B, Neena V.V and Akhil Paulose, First Edition
9. Online Resources : https://www.oracle.com/in/java/technologies/javase-downloads.html, https://docs.oracle.com/javase/tutorial/

Course Outcomes

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

- Develop Java programs based on Object-Oriented concepts, arrays, strings, inheritance, and polymorphism.
- Implement interfaces, packages, exception handling, threads, and file handling methods.
- Demonstrate the concepts of applets, implement graphics and AWT controls using Color and Font classes, and apply Swing class hierarchy with event handling
- Construct programs using layout managers, menus, and dialog boxes, and implement database connectivity using JDBC.
- Develop GUI applications and implement networking concepts using socket programming.

Course Code	Course Title	Total Credits
MCACP206	**Software development lab-II (PHP & React)**	**2**

Course Objectives

- To understand the general concepts of PHP scripting language for the development of Internet websites.
- To understand the basic functions of MySQL database program.
- To learn the relationship between the client side and the server side scripts.
- To understand the fundamentals of React, including its purpose, benefits, and role in modern web development.
- To understand side effects, API data handling, state sharing between components, and apply these concepts through a mini project.

Module No.	Title & Contents	No. of Sessions
1	**PHP**: Introduction, Variables, echo / print , Data types , Strings , Constants , Operators , Control structures: Functions, Arrays, Super-global variables Implementing .**object-oriented programs using PHP**: Creating classes and accessing class members in different php pages, inheritance.	8

2	**PHP Forms**: Form handling, form validation, form required, Form Complete, Date and time, Cookies, Sessions. **File Handling in PHP, File Upload**	10
3	**PHPMyAdmin** : db management in PHPMyadmin (create, drop, rename), table management (create, drop, rename, setting primary key, auto increment, default values, null),import data to the db (CSV/SQL), export data from db(CSV/SQL). **Connecting MySql from PHP:** mysqli_Connect, mysqli_querry(create, insert, update, delete, limit data) ,mysql_close	8
4	**Getting Started with React** - What is React & why use it ,- Setting up with Vite, - Project structure basics , JSX syntax **Components & Props** - Functional components, Reusable components, Passing & using Props, One-way data flow **useState()** - managing data, - Event handling (onClick, onChange), Controlled inputs (forms basics)	10
5	**Side Effects & API Data** - useEffect() — when and why, Fetching data from an API,Loading & error states **Sharing State Between Components**- Lifting state up, Prop drilling problem, useContext() — simple solution (to solve props drilling problem(later learn about redux)), lifeCycle methods (optional , because its confusing for beginners) **Mini Project** - Build one small app using everything above, Reinforces independent problem-solving	12

* ***Lab manual is attached as Annexure 4***

Text Books & References

1. Web Programming, Chris Bates, 3 rd Edition; Pub: John Wiley & Sons
2. The complete reference PHP, Holzner; 1st Edition McGraw Hill Education,
3. https://github.com/PHPMailer/PHPMailer
4. Learning React: Modern Patterns for Developing React Apps (2nd Edition) by Alex Banks and Eve Porcello,https://riptutorial.com/ebook/reactjs
5. React Explained: Your Step-by-Step Guide to React by Zac Gordon ,https://www1.goramblers.org/enrollment/files?docid=BrC65-3943&title=fullstack-react-book.pdf
6. Road to React :Robin Wieruch,https://freecomputerbooks.com/The-Road-to-Learn-React.html
7. https://www.roadtoreact.com/
8. https://www.syncfusion.com/succinctly-free-ebooks/react-succinctly
9. https://www.dbooks.org/reintroducing-react-5591710361/

Course Outcomes

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

- Demonstrate implementation of variables, data types, control structures, functions, arrays, super-global variables, and object-oriented programming concepts
- Design interactive web applications for form handling, validation, cookies, sessions, file handling, file uploads, and email functionality
- Manage databases using PHPMyAdmin and interact with MySQL through PHP by performing CRUD operations, setting constraints, importing/exporting data, and establishing database connections
- Develop interactive React applications using JSX, components, props, state management (useState), event handling, and controlled forms with Vite setup.

- Implement API integration, manage shared state, and build a React mini project using useEffect and useContext.

Course Code	Course Title	Total Credits
MCACP207	**Advance Operating System Lab using Linux**	**2**

Course Objectives

- To introduce the student to the Linux Operating system with particular emphasis on command line
- tools and utilities
- To learn and apply the various commands and utilities related to file system management, process
- management, program development and data processing.
- To apply the above-mentioned utilities and concepts in the writing of shell scripts

Module No.	Title & Contents	No. of Sessions
1	**Introduction to Linux Operating System and its Installation**: Work within a command line environment. **General purpose utilities**-cal, date, echo, printf, passwd, who, whoami, man, info, clear, tty, pwd, cd, uname. **Linux file system structure**-Absolute path and relative path, types of users, su and sudo commands, types of shells, types of files,local and global variables, env command, environment variables-HOME, PATH, PS1, PS2, LOGNAME, SHLVL, SHELL. **Basic Administration commands:Memory Usage commands** – top, free, vmstat, pstree, dmidecode **Disk related commands**: df,du,ulimit	8
2	**Handling files**-touch, cat, cp, rm, mv, ls, mkdir, rmdir, find Wild Characters **File comparison commands:**cmp, comm, diff. **I/O redirection:**Pipe & Filters- head, tail, more, less, grep, sort, wc, nl, pg, tr, tee, cut, paste, sort, sed, awk. **Compressing and archiving files**:tar, gzip, gunzip **Basic File Attributes**:chmod,chown,umask	8
3	**Process management commands**: init process, background and foreground processes, ps, nohup, nice, kill, time, fork. **Scheduling commands:** Cron daemon, at, batch, crontab **Communication:** utilities -mesg ,who-T ,talk, write ,wall ,finger,chfn,ping,traceroute,ftp, mail . **Linux login**: using Telnet,ssh.	8
4	**Essential System Administration**-Administrator's privileges, adding and removing users, user management, startup and shutdown commands. Configuration and system log files. **Managing file system** – mkfs, fsck mounting a file system Bash startup files	

	Installing packages Printer administration, Files and printer sharing using samba, **Introduction to Linux Servers**- Apache ,squid **Editors**-vi, Emacs X window system	8
5	**Shell Programming**-Shell variables, shell keywords, positional parameters, passing command line arguments, shift command. Command substitution, expr, bc, eval. **Conditional Statements**-test command, if statement, case structure **Loop control structure**:while, until and for loops, seq, break, continue Shell meta characters, functions, arrays, Advanced shell scripts.	16

**** Lab manual is attached as Annexure 7***

Textbooks & References

1. Sumitabha Das, "UNIX: Concepts and Applications" Tata McGraw Hill (Fourth Edition)
2. Yashwant Kanetkar, "UNIX Shell Programming" BPB Publications (First Edition)
3. Operating System - Linux, NIIT Press, PHI Publisher, 2006 Edition
4. .Christopher negus –Red hat Linux Bible,Wiley Dreamtech India 2005 edition

Course Outcomes

- Demonstrate the installation of Linux operating system and explain the linux file system architecture and setting environment variables and performing basic command-line utilities and administrative commands .
- Operate file and directory related commands in linux and Solve input/output redirection and and filters for data processing.
- Discuss and Demonstrate Linux processes,scheduling and communication commands and performs remote logins using Telnet and SSH.
- Perform essential Linux system administration tasks and Practice how to manage file systems and implement server setup and explain text editors and the X Window System.
- Develop and execute shell scripts using variables, control structures, loops, functions, and command-line arguments to automate system tasks efficiently.

Course Content -Semester 3

Course Code	Course Title	No of hours per week		Continuous Evaluation (Marks)	Summative Evaluation (Marks)	Total Marks	No. of Credits
		L	P				
MCACT301	Machine Learning Techniques	**4**	**-**	**25**	**75**	**100**	**4**
MCACT302	Cyber Forensics	**4**	**-**	**25**	**75**	**100**	**4**
MCACT303	Data Science & Big data Analysis	**4**	**-**	**25**	**75**	**100**	**4**
MCA304ET	Elective-2	**4**	**-**	**25**	**75**	**100**	**4**
MCACP305	Python Programming for Data Science		**4**	**25**	**75**	**100**	**2**
MCACP306	Mobile Application Development	**-**	**4**	**25**	**75**	**100**	**2**
MCACP307	Mini Project	**-**	**4**	**100**	**-**	**100**	**2**
MCACT308	Employability Skill Training-Phase 2	**2**	**-**	**50**	**0**	**50**	**1**
Total		**18**	**12**			**750**	**23**

Elective 2	
MCA304ET1	Cloud computing
MCA304ET2	Cryptography and Network Security
MCA304ET3	Business Management And Information System
MCA304ET4	Internet of Things (IoT)

Course Code	Course Title	Total Credits
MCACT301	**Machine Learning Techniques**	**4**

Course Objectives

The course aims to :

- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.
- To gain experience of doing independent study and research.

Module No.	Title & Contents	No. of Sessions
1	**Introduction to Machine Learning** Machine learning introduction, AI vs. Machine learning Vs. Deep learning, Types of machine learning-supervised learning, Unsupervised Learning, Reinforcement Learning,How machine learning works, Examples of machine learning applications	8
2	**Classification** Learning a Class from Examples, Vapnik-Chervonenkis (VC) Dimension, Bayesdecision theory-Introduction, Classification,Regression, Multivariate Data, Parameter Estimation, **Decision trees**- Univariate Trees, Pruning, Nearest Neighbor Classification, Support Vector Machines	10
3	**Feature Extraction** Feature Extraction and Selection: Entropy minimization, Feature selection through functions approximation, Binary feature selection. **Dimensionality Reduction**: Problems of dimensionality, Principal Component Analysis, Factor analysis, Linear Discriminant Analysis.	10
4	**Clustering** Introduction, Similarity measures, Clustering criteria, Distance functions, k-Means Clustering, Hierarchical clustering, DBSCAN **Combining Multiple Learners** Voting, Bagging, Boosting	8
5	**Artificial Neural Networks:** Introduction, The Perceptron, Training a Perceptron,Learning Boolean Functions, Multilayer Perceptrons, Feedforward operation and classification, Backpropagation Algorithm, Training Procedures, **An Illustrative Example:** Face Recognition using NN. Why generative models? Generative Vs Discriminative models	12

Text Books & References

1. Ethem Alpaydin, Introduction to Machine Learning, Second Edition.
2. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification, Wiley, New York, 2001.
3. Tom M. Mitchell, “Machine Learning”, McGraw Hill International Edition
4. Chris Bishop, Pattern Recognition and Machine Learning
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning Data Mining,Inference,and Prediction
6. V. S. Devi, M. N. Murty, “Pattern Recognition: An Introduction”, Universities Press, Hyderabad, 2011.
7. Earl Gose , Steve Jost, “Pattern Recognition and Image Analysis”, PHI Publishers, 1997.

Course Outcomes

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

- Summarize the key concepts of machine learning, including its types and applications
- Analyse classification methods like decision trees, support vector machines, and nearest neighbor classification, along with techniques to evaluate their effectiveness
- Categorize feature extraction and selection techniques along with dimensionality reduction methods to streamline data processing and improve model performance.
- Examine clustering techniques along with ensemble methods to evaluate their effectiveness in improving data grouping and model performance.
- Apply the concepts of perceptrons, multilayer perceptrons, backpropagation, and training procedures to design and train neural networks for tasks like face recognition, and to differentiate Generative and Discriminative models.

Course Code	Course Title	Total Credits
MCACT302	**Cyber Forensics**	**4**

Course Objectives

The course aims to :

- to provide an understanding of computer forensics fundamentals.
- to analyze various computer forensics technologies.
- enable students to understand, explore and acquire a critical understanding in Cyber crimes and Cyber Law.

Module No.	Title & Contents	No. of Sessions
1	**Computer Forensics Fundamentals**: What is Computer Forensics, Use of Computer Forensics in Law Enforcement, Steps taken by Computer Forensics Specialists, Scientific method in Computer Forensic Analysis. **Types of Computer Forensic Technology**: Types of Military Computer Forensic Technology, Types of Law enforcement, Types of Business Computer Forensic Technology **Types of Computer Forensic Systems**-Basics of Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Biometric Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless network security systems.	11
2	**Data Recovery**: Data recovery defined, Data backup and Recovery, The role of Backup in Data Recovery, The Data- Recovery Solution, Hiding and Recovering Hidden Data. **Evidence Collection**: Why Collect evidence, Collection options, Types of Evidence, Rules of evidence, General procedure, Collection and Archiving, Methods of collection, Artifacts, Collection steps, Controlling contamination, Reconstructing the attack.	9
3	**Conducting Digital Investigation**-Digital investigation process models, Scaffolding for digital investigations, Applying scientific method in Digital investigations-Formation and Evaluation of Hypotheses, Preparation, Survey, Preservation, Examination, Analysis, Reporting and Testimony. **Computer Basics for Digital Investigators**-Basic Operation of Computers, Representation of Data, Storage Media and Data Hiding, File Systems and Location of Data, Dealing with Password Protection and Encryption, Log files, Registry, Internet traces.	10

4	**Cyber Crimes**-What is Cyber Crime, Categories of Cyber Crime-Against Individual, Institution and States. **Crime Types**-Basics of SQL Injections, Theft of FTP password, Cross-site scripting, Viruses, Worms, Logical bombs, E-mail bombing, DoS attack, Spamming, Web jacking, Identity theft and Credit card fraud, Data diddling, Salami attacks, Phishing, Cyber stalking, Spoofing, Pornography, Defamation, Computer vandalism, Cyber terrorism, Cyber warfare, Hacking **Types of Hackers**-Black hat, White hat, Gray hat. Different types of Malwares	10
5	**Cyber Laws-**Defining Cyber Law, Concept and scope of Jurisprudence, Basics of Cyber Space, Basics of IPC and CrPC, Indian Evidence Act. **IT Act 2000**-Introduction to IT Act 2000,Amendment in IT Act, Different Offences under IT Act 2000-Sections:S.65,S.66, S.66A, S.66B, S.66C, S.66D, S.66 E, S.67, S.67A,S.67B,S.67C.	8

Text Books & References

1. Computer Forensics: Computer Crime Scene Investigation, John R. Vacca, 1st Edition, Charles River Media, 2005.
2. Digital Evidence and Computer Crime Forensic Science, Computers and the Internet, Eoghan Casey, 3rd edition, Elsevier, Academic Press, 2011.
3. Cyber Law & Crimes, 3rd Edition- Barkha &U.Rama Mohan,3rd edition,Asia Law House.
4. Digital Evidence and Computer Crime, 3rd Edition, Eoghan Casey,Academic Press
5. http://www.ijlt.in/pdffiles/Information-Technology-Act-(as%20amended%20in%202008).pdf

Course Outcomes

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

- Discuss the fundamentals of computer forensics methodologies and technologies
- Analyze data recovery techniques, backup strategies, and forensic evidence collection methods
- Assess digital investigation models, scientific methods in forensic analysis, and utilize computer fundamentals to identify, preserve, and analyze digital evidence
- Interpret various types of cyber crimes, hacking techniques, malware threats, and their impact on individuals, institutions, and states,
- Discuss the cyber laws, the legal framework governing cyberspace, and the provisions of the IT Act 2000, including various cyber offenses and their legal implications

Course Code	Course Title	Total Credits
MCACT303	**Data Science & Big Data Analysis**	**4**

Course Objectives

- To Familiarize participants with the scope and applications of Big Data.
- To impart basic insights to students about use of various Scientific Models in Data Science.
- To provide basic insights into Big Data analysis through Data Mining .

Module No.	Title & Contents	No. of Sessions
1	**Introduction to Data Mining** Introduction – Need for Data Mining – What Kinds of Data, Kinds of Patterns, Technologies, Applications and Issues - Data Objects and Attribute Types Data - Basic Statistical Descriptions of Data - Data Visualization - Measuring Data Similarity and Dissimilarity - Data Pre-processing-An overview, Data Cleaning, Data Integration, Data Reduction- Overview, Attribute subset selection, Feature creation, Data Transformation and Discretization, OLTP vs OLAP.	9
2	**Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods** Basic Concepts-Market Basket Analysis, Frequent Itemsets, Closed Itemsets and Association Rules, Frequent Itemset Mining Methods - Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, A Pattern-Growth Approach for Mining Frequent Itemsets, Mining Frequent Itemsets Using the Vertical Data Format, Mining Closed and Max Patterns, Classification- Basic Concepts, General Approach to Classification, Cluster Analysis- Basic Concepts, Requirements for Cluster Analysis, Overview of Basic Clustering Methods	11
3	**Introduction to Data Science** Benefits and uses of data science and big data, Facets of data, The data science process, The data Science Process- Defining goals, Retrieving Data, Cleansing and Transforming data, Exploratory Data analysis, Build Models, Visualization. **Understanding Big Data** - What is big data; why big data – convergence of key trends – unstructured data – Industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies.	10
4	**Overview of Big Data, Techniques**: Structuring Big Data, Elements of Big Data, Big Data Analytics –Introducing Technologies for Handling Big Data : Hadoop, Cloud computing and Big data, In-memory computing - Understanding Hadoop Ecosystem: HDFS, MapReduce, Hbase, Understanding MapReduce fundamentals.	9

5	**Storing Data in Databases and Data Warehouses**: RDBMS and Big Data, Non-Relational Database issues, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouses - Processing Your Data with MapReduce: Developing Simple MapReduce Application - Understanding Hadoop YARN Architecture: Advantage, Architecture, Working , YARN Schedulers – Introducing Hive, Getting Started with Hive, Hive Services, Data Types in Hive, Built-In Functions in Hive.	9

Text Books and References

1. Jiawei Han, Micheline Kamber and jain Pei “Data Mining Concepts and Techniques” Third Edition, Elsevier, (c) 2012.
2. Davy Cielen, Arno D.B. Meysman, Mohamed Ali “Introducing Data Science” 2nd edition, 2016.
3. DT Editorial Services,BIG DATA, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization.
4. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
5. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
6. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
7. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
8. Bill Schmarzo, “Big Data : Understanding How Data Powers Big Business”, Wiley, 2013
9. The Apache HBase HandBook Online : http://hbase.apache.org/book.html

Course Outcomes

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

- Discuss various data mining techniques for analyzing and preprocessing data, discovering patterns and outline the applications of data mining.
- Interpret techniques for mining frequent patterns, associations and correlations, including classification and clustering methods for data analysis.
- Explain Data science processes and demonstrate big data concepts for real-world applications across various industries.
- Discuss Big Data concepts, cloud ,Hadoop ecosystem and in-memory computing for efficient data processing
- Compare data storage paradigms and discuss processing frameworks such as MapReduce/YARN and Hadoop tools.

Course Code	Course Title	Total Credits
MCA304ET1	**Cloud Computing**	**4**

Course Objectives

The course aims to

- To Understand the fundamental concepts of cloud computing.
- To impart basic insights cloud computing architecture and virtualization in the cloud.
- To understand data storage and different cloud computing services
- To Understand cloud security and tools and technologies used for cloud computing
- To provide basic insights into various cloud platforms used in industry, cloud computing applications, future directions and trends.

Module No.	Title & Contents	No. of Sessions
1	**Cloud Computing Foundation** Introduction to Cloud Computing – History, importance and characteristics of Cloud computing. Move to Cloud Computing – migrating in to the cloud, seven step model. Types of Cloud – Public and Private Cloud, Cloud Infrastructure, Cloud Application Architecture. Working of Cloud Computing- Trends in Computing, Cloud Service Models, Cloud Deployment Models, Pros and Cons of Cloud Computing, Cloud Computing and Services: Pros and Cons	10
2	**Cloud Computing Architecture and Virtualization** Cloud life cycle model –Cloud Architecture. Cloud Modelling and Design – Virtualization- types of virtualization, benefits and pitfalls of virtualisation, virtualisation in Grid and Cloud, CPU virtualisation, network and storage virtualisation.	10
3	**Data Storage and Cloud Computing services** Data Storage - Data Storage Management, File Systems, Cloud Data Stores, Using Grids for Data Storage. Cloud Storage – Data Management for Cloud Storage, Data intensive Technologies for Cloud Computing- Cloud Storage from LANs to WANs - Distributed Data Storage, Applications Utilizing Cloud Storage. Cloud Services – software as a service, platform as a Service, infrastructure as a service, other cloud services.	10
4	**Cloud Computing Security and tools** Risks in Cloud Computing – Data Security in Cloud – Cloud Security Services Cloud Computing Tools- Tools and Technologies for Cloud, Cloud Mashups, Apache Hadoop, Cloud Tools- VMWare, Eucalyptus, CloudSim, OpenNebula, Nimbus.	10
5	**Cloud Applications and Future Cloud** Microsoft Cloud Services, Google Cloud Applications, Amazon Cloud Services, Cloud Applications. Future Cloud- Mobile cloud, Autonomic	8

	cloud engine, Multimedia Cloud, Energy aware Cloud computing, Jungle Computing.	

Text Books & References

1. Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014
2. "Cloud Computing – insights into New-Era Infrastructure", Kumar Saurabh, Wiley India,2011.
3. "Cloud Computing: Implementation, Management, and Security" John W.Rittinghouse and James F.Ransome, , CRC Press, 2010.
4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
5. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
6. "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things",Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.
7. "Cloud Computing, A Practical Approach" Toby Velte, Anthony Velte, Robert Elsenpeter, TMH, 2009.

Course Outcomes

- Describe the basic cloud computing concepts, types, models, migration steps, and evaluate its pros and cons.
- Impart foundational knowledge of cloud computing architecture and analyze the concept of virtualization to evaluate its role in enhancing resource efficiency and scalability.
- Define and compare cloud storage solutions, analyze data storage technologies, and demonstrate cloud service models effectively.
- Evaluate cloud security risks and services, analyze cloud tools and technologies, and explain open-source cloud concepts comprehensively
- Differentiate various cloud platforms used in the industry and discuss the future directions and trends in cloud computing.

Course Code	Course Title	Total Credits
MCA304ET2	**Cryptography and Network Security**	**4**

Course Objectives

The course aims to provide

- Provide an understanding of data security using various cryptographic algorithms.
- Enable students to identify the underlying network data security.
- Identify the implementation of cryptographic methods to provide email and web security.

Module No.	Title & Contents	No. of Sessions
1	**Introduction**: OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Model for Network Security. **Classical Encryption Techniques**- Ceaser, Playfair, Hill and Railfence Ciphers. **Mathematical Tools for Cryptography** – Basic concepts of Groups, Rings, Fields, Modular Arithmetic, Euclidean Algorithm, Finite Fields of the form GF(p), Polynomial Arithmetic, Finite Fields of the form GF(2^n). **Block Ciphers and Data Encryption Standard** - Feistel Cipher Structure, Data Encryption Standard, Strength of DES.	**12**
2	AES cipher, Multiple Encryption and Triple DES, Block Cipher Modes of Operation, Stream Ciphers and RC4, Pseudo Random Numbers, Pseudo Random Sequences, **Introduction to Number Theory:** Basic concepts of Prime Numbers, Fermat's and Euler's Theorems, Miller-Rabin Algorithm, Discrete Logarithm. Public-Key Cryptography and RSA algorithm, Security of RSA.	**10**
3	**Key Management** - Diffie-Hellman Key Exchange Algorithm, Elliptic Curve Cryptography, **Message Authentication and Hash Functions** - Authentication Requirements, Authentication Functions, Message Authentication Code, Simple Hash Functions. Hash and MAC Algorithms – SHA -512, HMAC, Digital Signatures, Digital Signature Schemes- RSA Digital Signature Schemes, ElGamal Digital Signature Scheme, Authentication Protocols	**12**
4	**Network Security Applications –Key Distribution and User Authentication** - Principles- Remote User Authentication, Symmetric Key Distribution using Symmetric Encryption, Kerberos, Key Distribution using Asymmetric Encryption, X.509 Certificate, Public-Key Infrastructure. **Network Access Control and Cloud Security**-Network Access Control, Extensible Authentication Protocol, IEEE802.1X Port-Based Network Access Control, Cloud Computing, Cloud security Risks and Counter measures, Data protection in the cloud.	**7**
5	**Electronic Mail Security** – PGP, S/MIME. **IPSecurity** – Overview, Architecture, AH, ESP, Internet Key exchange. **Web and E- Commerce Security**- SSL/TLS, SET	**7**

Text Books & References

1. William Stallings, Cryptography and Network Security. Principles and Practice, 4th edition, Prentice Hall.
2. Behrouz A. Forouzan, Cryptography & Network Security,Tata McGraw Hill.
3. William Stallings, Network Security Essentials: Applications and Standards, Sixth Edition, Pearson India Education Services Pvt.Ltd.

Course Outcomes

- Understand the types of cryptographic algorithms and methods used to implement security of data at various levels and on the network.
- Students are able to understand the mathematical tools behind each algorithm.
- Understand secure key exchange protocols.
- Be able to digitally sign emails and files.

Course Code	Course Title	Total Credits
MCA304ET3	**Business Management And Information System**	**4**

Course Objectives

- To understand the concepts of managerial functions and practices and to introduce organization structure.
- To Familiarize participants with the different kinds of Information Systems in Business
- To make the participants familiarize with the Information Technologies and Methods used for effective Decision making in an organization.
- To provide basic insights into the concepts of global business systems.
- To familiarize the software project management environment.

Module No.	Title & Contents	No. Of Sessions
1	**Management And Decision Making:** Basic Managerial Concepts, Levels Of Management, Managerial Skills, Concept Of Management Principles, Managerial Functions. Planning-meaning, Nature, Structure, Steps, Effective Planning. Organizing-meaning, Process, Structure, Types Of Organization. Staffing-meaning, Nature, Staffing Process, Recruitment & Selection. Motivation-significance, Motivational Theory -maslow's Need Hierarchy. Leadership, Communication -formal & Informal. Barriers, Effective Communication, Controlling-steps, Objectives, Features Of A Good Control System.	8
2	**Mis And Digital Firm** Mis-definition, Physical And Conceptual View Of Mis, Role Of Mis, Management Effectiveness And Mis, Mis For A Digital Firm, E-business Enterprise, Organisation Of Business In A Digital Firm, E-business, E-commerce, E-communication, E-collaboration, It Impact On Society, Impact Of It On Privacy, Ethics, Intellectual Property, Copyright, Patents.	8

	Decision Making Process In Business Organisation: Decision Making Process, Types Of Decisions, Selection Of Decision Alternatives, Four Ways Of Decision Analysis.	
3	Information Concepts-characteristics, Types, Methods For Collection Of Data And Information. Knowledge And Kms, Bi For Mis, Tools And Techniques Of Bi, Generation Process Of Bi, Applications Of Is And It To Management Functions Of The Industry. **Applications Of Information Systems In Manufacturing And Service Sector-** Personnel Management, Fm, Product Management, Raw Material Management, Marketing Management, Service-concept, Process Cycle, Sms, Mis Applications In Service Industry.	10
4	**Dss, Ai Applications** Dss-concept, Types, Gdss, Ai System, Expert System, Neural Networks, Applications Of Ai-interpretation Systems, Prediction Systems, Diagnostic Systems, Design Systems, Monitoring And Control System, Repair System, Kbes, Decision Tree For Decision Analysis, Flow Chart Of Expert System Of Online Support. **Systems For Management Of Global Enterprise:** Ems, Erp, Erp Model And Modules, Characteristics, Erp Implementation, Scm, Crm, Features Of Global Enterprise.	12
5	**Software Project Management** Introduction, Difference Between Software Projects And Other Types Of Projects, Software Project Management Activities, Steps In Project Planning, Formal Planning And Control Tools-gantt Chart, Pert Chart, Managing People In Software Environments, Software Quality-product And Process Quality Management-iso, Sei Cmm, Cmmi, Six Sigma.**Prince2** Project Management Method-introduction, Components, Planning Techniques, Major Prince2 Processes.Pm Tools.	10

Text Books & References

1. Principles of management, R.N. Gupta, S. Chand &Company Ltd.
2. Principles of management, L.M. Prasad, S. Chand publication
3. Business management, R.K. Sharma & Sasi K. Gupta.
4. Management Information Systems-Waman S. Jawadekar, 5th edition, McGraw Hill Publication
5. Management Information Systems- O'Brien, Marakas and Behl,10th edition, Tata McGraw Hill Publication.
6. Management Information Systems Laudon & Laodon,13th Edition, Pearson Education.
7. Software Project management , Bob Hughes, Mike Cotterell,5th edition, McGraw Hill Publication

Course Outcomes

- The participants will get basic insights into the Flow of Information in an Organisation
- The participants will understand how data and information is used in the process of managerial decision making
- The participants will be familiarized with the common information systems used in local and global business organisations.

- The participants will be able to understand the management of software projects and methods used for that.

Course Code	Course Title	Total Credits
MCA304ET4	**Internet of Things (IoT)**	**4**

Course Objectives

- To understand the concepts of Internet of Things and be able to build IoT applications.
- To understand various building blocks and working of state-of-the-art IoT systems.
- To get insights to conceive and build IoT systems on their own.

Module No.	Title & Contents	No. of Sessions
1	**Understanding the Internet of Things (IoT):** Defining IoT, Characteristics of IoT, Physical design of IoT-Things in IoT, IoT protocols, Logical design of IoT, Functional blocks of IoT, IoT communication models and APIs, IoT enabling technologies, IoT levels & Deployment templates.	10
2	Domain specific IoTs, Networking IoT and Communication protocols – Link Layer, Network Layer, Transport layer, Application Layer, Wireless Sensor Networks and Machine to Machine communication- Differences and similarities between M2M & IoT, Software defined networking, Network function virtualization.	10
3	M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol –Modbus– Zigbee Architecture – Network layer –LowPAN - CoAP – Security.	9
4	Building IoT - RASPBERRY Pi- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device, Sensor deployment & Node discovery, Data aggregation & dissemination	10
5	Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, Implementation of IoT.	9

Text Books and References

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015

4. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.
6. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley &Sons, 2013.
7. Cuno Pfister, “Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud”, Maker Media, 2011.
8. Pethuru Raj and Anupama C. Raman , “The Internet of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press).

Course Outcomes

- Understand the definition and significance of the Internet of Things
- Understand the various application areas of IoT, Study the protocol stack of IoT communication, get an understanding of differences between Machine to Machine and IoT. Get basics of Software Defined Networking (SDN) and Network Function Virtualization (NFV).
- Illustrate the protocols used by M2M, WSN, SCADA and RFID. Understand architecture and protocol stack of Zigbee, BACNet, LowPAN, CoAP
- Learn to build a simple IoT system using Raspberry Pi. Basic coding of Python to implement IoT system, understand the concepts of IoT devices, sensor deployment, node discovery. Enumerate the data aggregation & dissemination method
- Acquire basic knowledge of Arduino programming to build an IoT system, learn how to interface sensors & actuators with Arduino software.

Course Code	Course Title	Total Credits
MCACP305	**Python Programming for Data Science**	**2**

Course Objectives

- To provide knowledge of different data types, basic data structures and other programming constructs of Python programming language.
- To provide the student with an adequate understanding of python programming concepts and principles to enable them to design efficient programs.
- To impart knowledge to develop web-based applications using the Django framework.
- To equip the students to prepare, analyze and visualize the data from the large quantity of data given and also to implement the machine learning algorithms

Module No.	Title & Contents	No. of Sessions
1	**Data Types, Data and Control Structures , Operators** Introduction to python, Python variables and assignments, **Data types in python**-Numbers, Strings, List and List processing, Tuple, Set, Dictionary. **Operators**. **Flow Control**: – Decision making statements and loops, Functions: - Function and Function arguments, Anonymous functions, Recursive functions, User defined functions.	12

2	**Classes, File Handling and Database Programming** **Class**: – Class, Constructor and methods. **File handling in python**:- Opening a file, Closing a file, Writing to a file, Reading from a file. **Modules:-** Modules and importing modules. **Exception Handling**: -Built -in-Exceptions and user defined exceptions. **Database programming**:- python-SQLite connectivity	8
3	**Web programming with Django** **Python web application framework - Django:-** Introducing models, Views, Templates, urls, Custom user models, Permissions, Static and dynamic web pages, Deployment.	8
4	**Handling data in Data Science** Introduction to Data Science. **Exploring data analysis with Pandas** : -Accessing and preparing data - Reading a file ,indexing, selecting a subset. D**ata preprocessing with python**:-Dropping columns in a dataframe, Changing the index of a dataframe, Tidying up fields in the data, Cleaning columns and data, Renaming columns and skipping rows. **Numerical analysis using NumPy:**-Handling arrays and analysing data.	8
5	**Data Visualization and Machine Learning algorithms** **Data visualization with Matplotlib** :-Understanding the plot, Creating 2-D plots, Multiple plots, Types of plots. **Linear Regression:-**Simple and Multiple regression**, Machine Learning algorithm implementation with Scikit-learn:** - Implementation of at least one classification and clustering algorithms. **Introduction to Text Analytics**.	12

Implementation *of 4th and 5th module - Jupyter Notebook. Familiarization of Google Colab for data science is desirable*

**** Lab manual is attached as Annexure 6***

Text Books & References

1. An Introduction to Python by Guido Van Rossum, Fred L.Drake, Network Theory Limited.
2. Programming and Problem Solving with Python, Ashok Namdev Kamthane & Amit Ashok Kamthane, McGrawHill Education (India) Private Limited
3. Django for Beginners: Build websites with Python and Django Paperback – March 7, 2018 by William S. Vincent
4. Python Data Science Handbook - Essential Tools for Working with Data , Jake VanderPlas,O'Reilly
5. Exploring Python, Timothy A Budd, Tata McGraw Hill Education Private Limited, Edition 2011
6. Think Python,Allen B Downey,O'Reilly
7. Programming in Python 3 by Mark Summerfield, Pearson Education
8. Python Applications Programming Third Edition, Wesley J.Chun, Pearson India Education Services Pvt.Ltd
9. Mastering Python for Data Science by Samir Madhavan, PACKT Publishing
10. Python for Data Analysis Paperback – 26 October 2012 by Wes Mckinney , O'REILLY
11. Data Science from Scratch- JoelGrus,O'Reily Publication

Online references:

1. http://www.tutorialspoint.com/python/ , http://docs.python.org/tutorial/ ,
2. http://zetcode.com/tutorials/pythontutorial/,http://www.sthurlow.com/python/,
3. http://www.djangoproject.com/,http://www.djangobook.com/ ,https://realpython.com/

Course Outcomes

- Implement fundamental Python programming concepts, including data types, operators, control structures, and functions, to develop efficient and structured programs
- Design and develop Python applications using object-oriented programming, file handling, modular programming, exception handling, and database connectivity with SQLite.
- Develop and deploy dynamic web applications using the Django framework for static and dynamic web pages.
- Analyze data manipulation,preprocessing and exploration using Pandas and NumPy
- Build 2-D Plots for data representation using Matplotlib and evaluate Machine learning algorithms for clustering ,classification and regression and interpret Text analytics

Course Code	Course Title	Total Credits
MCACP306	**Mobile Application Development**	**2**

Course Objectives

- To understand the fundamentals of Mobile Computing in Kotlin and the basic programming concepts
- To develop a strong foundation in Object-Oriented Programming using Kotlin by understanding core concepts and implementation techniques
- To understand and apply functional programming concepts in Kotlin, including functions as objects, lambda expressions, higher-order functions, coroutines, and collection operations for writing concise and efficient programs
- To understand Kotlin interoperability with Java and JavaScript, explore Kotlin tools and Android features like extensions and view binding, and apply these concepts by developing a complete application project.
- To create project in Android Studio using Kotlin

Module No.	Title & Contents	No. of Sessions
1	Kotlin Introduction – Overview, Features, Environment Setup, Editing, Compiling, and Running, Execute for Android Kotlin Basics: Basic Types, Defining Local Variables, Comments, Functions, Packages and Imports, If Expression, When Expression For Loops, While Loops, Break and continue Loop Understand functions (basic with return type, three dots operator, new functions: default arguments and named arguments, extension). Recall exceptions and examine why checked exceptions are not supported.	10
2	OOPs in Kotlin: Object Oriented Programming, Association, Composition, Aggregation Inheritance Lists Sets, and Maps, Interfaces, and Implementation, Design by Contract Classes and Objects : Constructors, Static methods, public-private internal protected class, methods Objects, Delegation	8

3	Functional Programming in Kotlin: Functions as objects, Creating and returning functions, Nested functions, Dynamic functions, Anonymous(lambda) functions, Unit returning functions, Inline Functions, Extension Functions Couroutines ,Dictionary and Set Comprehensions, Collection interconversion patterns	8
4	Kotlin JavaScript Interaction: Calling JavaScript from Kotlin, Tools in Kotlin Calling Java from Kotlin, Calling Kotlin from Java Kotlin for Android: Understand extensions. Examine why view Binding is more recommended. Develop the application project as a recap	12
5	Creating project in Android Studio using Kotlin	10

**** Lab manual is attached as Annexure 7***

Text Books & References

- Kotlin in Action - Dmitry Jemerov, Svetlana Isakova
- Android - Prasanna Kumar Dixit
- Beginning Android Application Development By Wei-Meng Lee, Wrox Publication
- Android Wireless Application Development By Lauren Darcey and Shane Conder, Pearson Education, 3rd ed
- Android 6 for Programmers - An App driven approach - Paul Deitel,Harvey Deitel, Alexander Wald
- Android Application Development -Carmen Delessio

Online URLs :

- https://www.w3schools.com/KOTLIN/index.php
- https://www.geeksforgeeks.org/kotlin/kotlin-programming-language/
- https://kotlinlang.org/docs/getting-started.html
- https://www.tutorialspoint.com/android/index.htm
- https://www.geeksforgeeks.org/android/android-tutorial/
- https://developer.android.com/get-started/overview

Course Outcomes

Student will be able

- To demonstrate the ability to understand Kotlin fundamentals, write and execute basic programs with control structures and functions, and apply concepts like extensions and exception handling effectively.
- To apply object-oriented programming concepts in Kotlin, including classes, inheritance, relationships, interfaces, and collections, to design and implement structured and reusable programs.
- To apply functional programming concepts in Kotlin, including higher-order functions, lambda expressions, coroutines, and collection operations, to build concise and efficient applications.

- To demonstrate the ability to integrate Kotlin with Java and JavaScript, utilize Android features like extensions and view binding, and develop a complete application using these concepts.
- To create project in Android Studio using Kotlin

Course Code	Course Title	Total Credits
MCACP307	**Mini Project**	**2**

Course Objectives

- To demonstrate a wide range of skills and knowledge learned
- To encourage the integration of knowledge gained in the previous course units.
- To demonstrate the application of students programming and research skills
- To apply the knowledge to complex computing problems
- To make the student able to specialize in specific areas of computer science

Phases	Description	No of Sessions
1	**Formation of Project Team:** Students should form a team to fulfill the project with a maximum of two members. However, an individual student can also undertake the project on his/her own. A faculty will be assigned for each team as a guide for assisting monitoring the project work	
2	**Identification of Topic**: The team should identify a topic of social relevance in discussion with the guide and should submit an abstract of the project for approval to the project coordinators.	
3	**First interim Presentation:** Once the title is approved students should work on it and present the system design documents Table design, DFD/UML during the first interim.	
4	**Demonstration of coding phase 1**	
5	**Demonstration & Testing of coding phase 2**	
6	**Submission of the draft report (The format is given as Annexure 8)**	
7	**Submission of the final report:** Students should submit the final report incorporating all the corrections suggested by the guide in the prescribed format. One hardbound copy can be kept with the student. The finalized softcopy of the project can be kept in the department/library.	

Textbooks & References

1. Software Engineering A Practitioner's Approach, Roger S Pressman, McGraw-Hill International Edition, Sixth Edition.
2. Applying UML and Patterns, Craig Larman, Pearson, third edition
3. Object-Oriented Modeling and Design with UML, Michael Blaha, James Rumbaugh, Person, second edition.
4. Ian Sommerville, Software Engineering VII th Edition, Pearson Education

Course Outcomes

- Practice acquired knowledge within the chosen area of technology for project development.
- Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- Reproduce, improve and refine technical aspects for engineering projects
- Work as an individual/ team in the development of technical projects
- Communicate and report effectively project related activities and findings

Course Code	Course Title	Total Credits
MCACT308	**Employability Skill Training-Phase 2**	**1**

Course Objectives

- Develop ways to extend and improve interpersonal skills, negotiating skills, leadership skills, creativity and conflict management skills.
- Enable students to appreciate the role of body language and voice tone in effective communication.
- Evaluate students 'thinking skills and how he/she controls the conversation through listening attentively and then having the perseverance to mould it towards his/her own direction.
- Equip students to effectively tackle the interview process, leaving a positive impression with the prospective employer.
- Familiarize students with interview questions and interview etiquette.
- Help students enhance their Technical skills on an interview basis.

Module No.	Title & Contents	No. of Sessions
1	**Interpersonal Communication And Leadership** Interpersonal Communication, Concept of Leadership, Types, Six Styles of Leadership, Qualities of Leadership, Functioning of Leadership - Goal Setting, Rising to Your Potential, Coordinating, Decision making, Interacting, Negotiating, Time Management, Change Management and Mentoring. Accountability, Public Speaking & Presentation Skills. **Activity: Team Game**	3
2	**Effective Technical Communication** **Fundamentals**: Importance and Need, Technical Communication Skills, Organisation in Technical Communication, Styles in Technical Communication, **Speaking Strategies**: Strategies for Good Conversation, Improving Listening Comprehension, Improving Fluency and Self-expression – Articulation, Pronunciation, Voice Quality, Accent and Intonation. Body Language – Eye Contact, Facial Expression, Gestures, Posture and Body Movements. **Activity: Exercises on Listening and Speaking**	2
3	**Group Discussion**	10

	Nature, Characteristics of Successful GD, Group Discussion Strategies, Techniques for Individual Contribution, Group Interaction Strategies, Practice Case Studies. **Activity: Group wise GD Training**	
4	**Individual And Group Interview** Characteristics of Interviews, Pre-Interview Preparation Techniques, Projecting a Positive Image, Answering Strategies. Types of Questions, Frequently Asked HR Questions **Activity: Sample interview** **Topics Covering On Technical:** C Language, Operating Systems, Data Structures, C++, Microprocessors, DBMS, Networking, Java Basics, Core Java, Advanced Java, PHP, Python, SQL and other relevant topics.	15
5	**Activity: Mock Interview** Individual & Group Interview Sessions	10

50 % of the syllabus is meant for online/ activity mode

Textbooks and Reference

1. Bharathi, T., Hariprasad, M. ed., Prakasam, V., *Personality Development and Communicative English*, Hyderabad, Neelkamal Publications Pvt. Ltd.,.
2. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata McGraw Hill Education Private Limited.
3. https://www.indiabix.com/interview/
4. https://www.campusgate.co.in/
5. https://www.sawaal.com/technical-questions-and-answers.html

Course Outcomes

- Explain the concepts of Interpersonal Communication and Leadership,recognize different leadership styles, practice key skills like decision-making and public speaking, and apply them in interactive activities.
- Explain the importance of technical communication, apply organizational and stylistic techniques in writing, demonstrate effective speaking and listening strategies, and practice fluency, pronunciation, and body language through interactive exercises.
- Explain the nature and characteristics of a effective Group Discussion (GD), apply effective strategies for individual contribution and group interaction, and demonstrate GD skills through practice case studies and interactive training.
- Explain the characteristics of individual and group interviews, apply effective pre-interview preparation techniques, answering strategies, and professional image projection, and demonstrate interview skills through mock interviews covering technical and HR topics.
- Develop confidence for attending individual interviews and practice essential skills for group interviews through structured preparation and mock interview sessions.

Course Content -Semester 4

Semester 4							
Course Code	**Course Title**	**No of hours per week**		**Continuous Evaluation (Marks)**	**Summative Evaluation (Marks)**	**Total Marks**	**No. of Credits**
		L	**P**				
MCACS401	Seminar	**3**		**50**	**-**	**50**	**2**
MCACP402	Main Project		**27**	**150**	**150**	**300**	**12**
MCACV403	Course Viva		**-**	**-**	**100**	**100**	**5**
Total						**450**	**19**

Course Code	Course Title	Total Credits
MCACS401	**Seminar**	**2**

Course Objectives

- To make students aware of the Current / Future trends related to Information Technology/ Computer Science/ Computer Application
- To improve the presentation skills of the students
- To develop the ability to seek clarification and defend the ideas of other research works effectively.
- To acquire skills to raise queries and to answer the queries in an effective manner.

Phases	Description
1	**Identification of Topic**: Each student will be assigned with an internal guide . Students should identify a topic of Current / Future trends related to Information Technology/ Computer Science/ Computer Applications in discussion with the guide.
2	**Submission of Abstract :** An abstract of the topic has to be submitted to the seminar coordinators for approval.

4	**Discussion with Guide** : Students should interact with the internal guide once in a week through online or offline mode and the guide should assess the progress of work and should keep a record of the same
3	**Submission of Report :** Students should prepare a seminar report as per the following guidelines ● No of pages: Not less than 15 (contents only) ● Size A4, One-sided ● Font: Times New Roman ● Text Size 12; Title Size 14 Underlined; Line spacing: 1.5 Full Justified ● Spiral Binding with uniformity in bind cover. ***The format is given as Annexure 9***
4	**Submission of Presentation Slides** : The students should get the presentation slides corrected by the internal guide and provide a hard copy with the sign of the internal guide before the presentation
5	**Presentation & Evaluation :** Every student is expected to present the seminar ((30-45 mins including Q/A and discussion sessions) before the evaluation committee consisting of two/three faculty members from the MCA Department duly appointed by the HoD.

Course Outcomes

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

- Provide insight knowledge in the selected topic of the seminar.
- Helps to improve analytical skills.
- To develop interest towards research in the field of Computer Science and its application areas.
- Improves communication and presentation skills
- Helps to nurture critical thinking skills.
- Improves comprehensive writing skills

Course Code	Course Title	Total Credits
MCACP402	**Main Project**	**12**

Course Objectives

- To demonstrate a wide range of skills and knowledge acquired during the course.
- To encourage the integration of knowledge gained in the previous course units.
- To demonstrate & implement students programming and research skills.
- To apply the knowledge to solve complex computing problems.
- To make the students capable of specialising in specific areas of Computer Science.

Phases	Description

1	**Identification of Topic**: A faculty will be assigned for each student as a guide for assisting and monitoring the project work . The student should identify a topic of social relevance in discussion with the guide . As the majority of the students are expected to work out a real-life project in certain industry/research and development laboratories/educational institutions/software companies, it is suggested to select the project with direct relevance to day-today activities of the student. However, it is not mandatory for a student to work on a real-life project. The project being developed can be hardware, Software application, IoT, and Mobile application.
2	**Submission of Synopsis:** The synopsis of the project consisting of Project Title/framework/frontend/backend along with the abstract should be submitted to the internal guide and one copy to the Project coordinator for approval. A student cannot start the project without getting the approval of the Project guide
3	**First interim (REQUIREMENT ANALYSIS PHASE) :** The students should submit a report to the internal guide and project coordinator with following contents on the date specified by the college - Introduction about the project - Detailed description regarding the requirement analysis phase - Difficulties faced in this phase
4	**Second Interim – DESIGN PHASE :**The second interim can be scheduled 25 days after the first interim. Students should report in the college and should give a presentation of his work before the evaluation committee. The Powerpoint presentation should contain the following - Project introduction. - DFD, Database Design, Form Design. - Difficulties faced.
5	**Third Interim:** The third interim can be conducted 15 days after the second interim**.** The students should send/submit their current status report of their project to their respective Internal guides and project coordinator through email / or report directly to the college. The status report should contain the updated and corrected Database design, DFD, and other modifications suggested to the students during the 2nd Interim Report.
6	**Fourth Interim –(TESTING AND IMPLEMENTATION PHASE):** The fourth interim can be conducted 25 days after the third interim report. Students are expected to present the following contents to the evaluation committee ● Introduction of the project ● The description of coding ● Testing and implementation of the project. ● Submit a copy of the Algorithm. (optional) ● Specify a report on the minimum requirements needed to run the software.

7	**Submission of Final Draft of Record** : Students have to submit a copy of the project report in the prescribed format, to their Internal Guides for correction within 15 days after the fourth interim**.** Project Report should compulsorily include software development. **The format of Record is given in Annexure 10.**
8	**Final Project presentation** : Students have to present their complete work (PowerPoint Presentation / Live project execution) before the internal evaluation team consisting of the project coordinators and the internal guide. The final project presentation should include a detailed explanation from chapter 1 to chapter 11. Students have to submit 2 hard bound copies of final project reports (Personal Copy & Office Copy) along with softcopy.
9	**External Evaluation :** Students have to explain their project and submit the final record, complete in all respects before the external evaluators.

Textbooks & References

1. Software Engineering A Practitioner's Approach, Roger S Pressman, McGraw-Hill International Edition, Sixth Edition.
2. Applying UML and Patterns, Craig Larman, Pearson, third edition
3. Object-Oriented Modeling and Design with UML, Michael Blaha, James Rumbaugh, Person, second edition.
4. Ian Sommerville, Software Engineering VII th Edition, Pearson Education

Course Outcomes

After successful completion of the project work, students will be able to:

- Apply Systems Development Life Cycle(SDLC) models to identify, analyse and evaluate system requirements.
- Design the system by constructing various design diagrams consisting of UML's, DFD's, flow charts, state diagrams etc..
- Acquire knowledge on the implementation of various software tools in the design process. ● Develop Code to provide a solution to the problem.
- Prepare the documentation and reports of the projects.
- Propose future scope and further enhancement of the system.
- Develop presentation and communication skills.

Course Code	Course Title	Total Credits
MCACV403	**Course Viva**	**5**

Course Objectives

- To ensure the subject knowledge acquired by the students.
- To verify the depth of knowledge gained through online courses.
- To assess the overall knowledge gained during the course of study.

Phases	Description
1	Viva Voce: The External evaluators will have to do a comprehensive evaluation of what the student learned through the entire MCA Programme . Students should be evaluated through all core subjects of the MCA programme and marks will be awarded on the basis of oral answers given by the student.
2	Evaluation of Online course certification : Students have to submit the certificate of the online course he/she has completed by the 3rd semester of MCA . 25 % of the total marks is set apart for this.

Course Outcomes

- To know the importance of each subject and its contribution towards knowledge.
- Evaluate and justify their level of knowledge after the MCA Programme.
- To throw light on the students regarding their areas of interest and the areas to be improved.

Annexures

Annexure 1	***Annexure 1 : Lab Record programs for MCACP106***
Annexure 2	***Lab Record programs for MCACP107***
Annexure 3	***Lab Record programs for MCACP205***
Annexure 4	***Lab Record Programs for MCACP206***
Annexure 5	***Lab Record Programs for MCACP207***
Annexure 6	***Lab Record Programs for MCACP305***
Annexure 7	***Lab Record Programs for MCACP306***

Annexure 8	***MCACP307 -Mini Project Guidelines***
Annexure 9	***MCACS401- Seminar Record Format***
Annexure 10	***MCACP402- Main Project Guidelines***

Annexure 1 : *Lab Record programs for MCACP106*

1. DDL commands to alter, drop and truncate
2. DDL commands to add constraints on column
3. DDL commands to add constraints on table
4. DML commands to insert, update and delete
5. Retrieval of data using simple select query
6. Retrieval of data using select query with where option
7. Built in Functions in DBMS
8. Set Operations
9. Sorting of Data
10. Subquery
11. Join Operations
12. Group-By-Having Clause
13. View, Sequences and Indexes
14. PL/SQL Programs
15. Procedure
16. Functions
17. Use of commit, savepoint, rollback
18. Grant and Revoke statements
19. Normal Forms
20. Database Connectivity with MYSQL as backend.

Annexure 2 : *Lab Record programs for MCACP107*

The list of practical programs is aiming to facilitate the students to get a deep understanding of C Concepts:

1. Program for familiarizing input/output operators in C.
2. Write a program to accept two numbers and find the sum.
3. Write a program to accept temperature in Fahrenheit and convert it to degree Celsius.
4. Write a program to find the larger of two numbers.
5. Write a program to determine if a given number is odd or even.
6. Write a program to find the largest of three numbers.
7. Write a program to find the lowest of three numbers.
8. Write a program to find the simple interest.
9. Write a program for the area and perimeter of a circle.
10. Write a program to the total and average of 5 marks of a student.
11. Write a program to find the compound interest.
12. Write a program to change the case of letters in a string.
13. Write a program to calculate the gross salary (DA is 40% and HRA is 20% of the basic pay).
14. Write a program to convert the distance given in KM into meters, feet, inches and centimeters.
15. Write a program to interchange the value of two numbers.

16. Write a program to reverse an array of numbers.
17. Write a program to generate the multiplication table of any given number.
18. Write a program to find the sum and count of odd & even digits in an array of numbers.
19. Write a program to find the number of occurrences of a digit in a number.
20. Write a program to find the biggest and second biggest digit in a number.
21. Program to find GCD, LCM of numbers.
22. Program to display alphabets A to Z using loops.
23. Program to calculate power of numbers.
24. Program to display Armstrong numbers between two intervals.
25. Program to convert decimal numbers to different bases.
26. Write a program to evaluate 1/1! +2/2! + 3/3... up to a given range.
27. Program to calculate standard deviation.
28. Program to check whether a number can be expressed as a sum of two prime numbers.
29. Program to calculate the average of numbers using arrays.
30. Program to read n integers into an array and sort the elements in the array
31. Program to read two matrices and find their sum.
32. Program to read a string (word), and check whether it is a palindrome word or not.
33. Program to read a string and count the number of vowels, consonants and spaces in it.
34. Program to read an array of strings and find the lengthiest string in it.
35. Program to use function to read an array of n numbers, find largest among them and display.
36. Program to sort an array using function.
37. Program to find the factorial of a given Natural Number n using recursive and non recursive functions.
38. Program to reverse a string using recursion
39. Program to various string operations using function
40. Program to multiply two matrices. Use functions to i) read matrices ii) multiplication iii)display matrix
41. Program to find the transpose of a matrix using a function.
42. Program to illustrate various storage classes.
43. Program to add two numbers using pointers.
44. Program to swap two numbers using function(call by reference)
45. Program to sort strings using an array of pointers.
46. Program to find sum of two matrices using an array of pointers.
47. Program to find the product of two matrices using a pointer to an array.
48. Program using structures to read and print data of n employees.
49. Program to prepare a rank list of n students based on total marks, name and marks obtained for 3 subjects should be read.
50. Program using structure read the personal data (name, address, phone no. etc) of n peoples and search the details of a particular person using function.
51. Program to create an employee file, read and display the details on console.
52. Program to create a file with n numbers, read the file and separate the even and odd numbers into two different files.
53. Program to create a text file and count number of characters, words and lines in it; and store the results in an output file.
54. Program to find largest of n numbers using command line arguments
55. Program to copy the content of one file to another using command line arguments.
56. Program to illustrate bit wise operators.
57. Program to illustrate macros
58. Program to count the number of lowercase, uppercase and special characters in a file.
59. Program to find the lengthiest line in a file.

60. Program to find the mismatch of opening and closing brackets in a file.

Towards the end of the paper a small project should be given to students in order to get an overall idea of the subject.

Some sample project titles:

1. Library management system
2. Restaurant management system
3. Banking system
4. Billing system etc

The lab record may include a minimum of 35 programs. The project should be included towards the end of the lab record and the same will be considered separately for external lab evaluation.

Annexure 3 : Lab Record Programs for MCACP205 (Object oriented programming with Java)

Demonstrate the Java application programs using any advanced text editors or frameworks.

All students are expected to develop minimum 30 programs (simple and complex) in the lab

1. Develop programs based on OOPs concept (6)
2. Inheritance programs –single and multilevel(2)
3. Implement interface concept
4. Programs to implement the usage of packages(2)
5. Programs to implement exception(2)
6. User defined exception
7. Multithreaded programming and synchronization(2)
8. Programs for handling file operations (2)
9. Applet basic programs –graphics programming, passing parameters, display image, simple moving banner (4)
10. Illustrate Event handling programs
11. Implement the java programs using Swing controls(4)
12. Database connectivity using swing
13. Socket programming-chat server
14. Develop a GUI application

Annexure 4: Lab Record Programs for MCACP206 Software development lab-II (PHP & React)

Demonstrate web page development using any text/HTML editors (Dreamweaver/ Eclipse/ Notepad++ etc). All students are supposed to prepare a lab record (written/printed) with a minimum 30 programs .

1. Develop programs based on control structures, functions and arrays (8)
2. Develop programs based on classes and inheritance (using functions of classes defined in the same file and in different file) (5)
3. Develop form-based PHP applications with server-side validations. (5)
4. Develop programs based on session and cookie (2)
5. Develop programs to demonstrate file handling in PHP.
6. Develop program to upload file (with displaying uploaded file in web page)
7. Develop programs based on database connectivity using PHP (5)
8. Develop a programs based on React.

Annexure 5: Lab Record Programs for MCACP207 Advance Operating System Lab using Linux

SET1: Commands

1. Installation of Linux Operating system.
2. Demonstrate a College Management system in Linux using File and Directory commands.
3. Familiarize and execute the commands of vi Editor.
4. Practice the Filter commands in Linux with suitable examples.
5. How to execute Redirection and pipes in Linux.
6. Implement File Administration commands in Linux.
7. Execute the Disk related commands in Linux
8. Illustrate the communication commands in Linux.

SET 2: Shell Scripts.

1. Write a script to read any 2 floating values and find the sum, difference, quotient, and remainder.
2. Write a script to read the length and breadth of a rectangle and radius of a circle and calculate the area and perimeter of the rectangle and area and circumference of the circle.
3. Write a shell program to find

    a) Sum of digits of a number
    b) Reverse of the number
    c) Determine whether the given number is a palindrome or not.

4. Write a shell script to display the digits which are in odd positions in a given integer.
5. Write a script to read the basic salary of n employees and calculate the gross salary

    If BP<15000, DA=30% of BP, HRA =Rs 500. TA = 10% of BP.

    If BP >=5000, DA=50% of BP, HRA=15%, TA=1000.

6. Write a script to read the cost and selling price of an item and to decide how much loss or profit has incurred by the seller.
7. Write a script to read 5 marks of n students. Find the total and return distinction if the total percentage >= 80. [Distinction] if total % is >=60 and <80 [first class].if total % is >=50 and <60 [second class] else print failed [<50].
8. Write a script to read a character and to display if it is lowercase, uppercase, digit or special character or not a character.
9. Write a script to prepare a multiplication table of a given number to any order.
10. Write a script to find the value of one number raised to the power$(a)^n$
11. Write a script to print all prime numbers from 1 to n.
12. Write a script to generate all combinations of a, b and c.
13. Write a shell script to sum up the following series

    1/1! + 2/2! + 3/3! + ….

14. Write a script to read a year and to decide whether it is a leap year or not. If no year is supplied then the current year is assumed.
15. Shell script to perform operations like display, list, make directory and copy, rename, delete, edit file.

16. Write a menu driven program to display the following options.
    - ➢ Contents of /etc/passwd
    - ➢ List of output of 'who'
    - ➢ Present working directory
    - ➢ Exit

17. Write a shell script to find how many terminals this user logged in.
18. Write a script to accept a filename while running the script and check it has the write permission, if yes prompt the user to enter a text and append the text to the given filename.
19. Write a shell script which displays a list of all files in the current directory to which you have read, write & execute permissions.
20. Write a shell script which receives two file names as arguments.It should check whether the two file's contents are the same or not .If they are the same, delete the second file.
21. Write a shell script, which will receive any number of filenames as arguments .The shell script should check whether such files already exist.
22. Write a shell script to perform operations for student data like view, add and delete records.
23. Write a shell script to sort the given numbers in descending order using Bubble sort .
24. Write a shell program to find the factorial of a number using function.
25. Write a shell program to determine whether the given string is palindrome or not using function.
26. Write a script to rename all c files to cpp files.
27. The word "mca" is present in some of the files supplied as arguments. Write a script to search each of these files, and to stop at the first file containing the word "mca" and report it.
28. Write a script to receive any number of filenames as arguments and to check whether the arguments supplied is a file or directory. If it is a directory, it should be appropriately reported. if it is a filename then name of the file as well as the number of lines present in it should be reported.
29. Write a script to read from a file which is supplied as a command line argument and count the number of lines and words. If there is no filename supplied, the script should accept text from the keyboard.
30. Write a shell script which receives an even number of file names. Suppose four file names are supplied then the first file should get copied into the second file, the third file should get copied into the fourth file, and so on. If odd numbers of file names are supplied then no copying should take place and an error message should be displayed.
31. Write a script to wish the user "Good Morning, Good Afternoon and Good Evening" when he logs in to the system based on the time.

Annexure 6: Lab Record Programs for MCACP305 Python Programming for Data Science

All students are supposed to prepare a lab record (written/printed) with minimum 30 programs including the mini project.

1. Develop programs based on different data types, control structures and functions (10)
2. Develop programs based on class, constructor and methods (2)
3. Perform file handling operations, modules, Built-in-exceptions and user defined exceptions (5)
4. Implement database connectivity using SQLite
5. Develop web application with static web pages and dynamic web pages using django framework (2)
6. Develop programs for data preprocessing with pandas and numeric analysis using NumPy (5)
7. Develop programs for implementing plots with Matplotlib (2)
8. Develop programs based on Linear regression

9. Implementation of at least one classification algorithm using Scikit-learn
10. Implementation of at least one clustering algorithm using Scikit-learn

Annexure7: Lab Record Programs for MCACP306 Mobile Application Development

1. Fundamentals of kotlin - variables, data types, basic concepts
2. Use operators and control flow (if, when etc)
3. Programs to Create and use arrays and loops
4. Write functions in Kotlin
5. Develop programs based on OOPs concept in Kotlin
6. Work with constructors and inheritance
7. Create class functions and objects
8. Creating project in Android Studio using Kotlin

Annexure 8: MCACP307- Mini Project Guidelines

The Mini Project is not only a part of the coursework, but also a mechanism to demonstrate the abilities and specialization. It provides the opportunity for the student to demonstrate originality, teamwork, inspiration, planning and organization in a software project, and to put into practice some of the techniques that have been taught throughout the previous courses.

The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research.

The course Mini Project is one that involves practical work for understanding and solving problems in the field of computing. Any computer science project usually consists of the following: **Analysis, Design, Coding/Implementation, and Testing** of some information system or subsystem, such as a piece of software. In this course, we expect a software system or subsystem.

Mini Project work shall be carried out under the **guidance** of a faculty. The student should demonstrate that he/she has acquired both analytical and practical skills in the field specialization. The student should submit the mini-project report at the end of the semester.

The project report should be documented with an engineering approach to the solution of the problem. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies, and professional standards.

CONTENTS OF THE ACADEMIC PROJECT REPORT

1. **Cover Page as per format** *Use the same format attached below*
2. **Certificate of the Head Of Department as per format** *Use the same format attached below*
3. **Certificate of the Internal project guide as per format** *Use the same format attached below*
4. **Declaration :** *By student – format given below*
5. **Acknowledgment :**

6. **Table of Contents** *Please use the MS Word Table of content feature for this and not a manual TOC.*
7. **Abstract:** *This should describe the problem and the solution given by your project in brief. Limit the description to 1-2 pages.*
8. **Chapter 1 Introduction**
    - ➢ Introduction
    - ➢ Problem Statement
    - ➢ Scope and Relevance of the Project
    - ➢ Objectives
9. **Chapter 2 System Analysis**
    - ➢ Introduction
    - ➢ Existing System
        - o Limitations of Existing System
    - ➢ Proposed System
        - o Advantages of proposed System
    - ➢ Feasibility Study
        - o Technical Feasibility
        - o Operational Feasibility
        - o Economic Feasibility
    - ➢ Software Engineering Paradigm Applied
10. **Chapter 3 :System Design**
    - ➢ Introduction
    - ➢ Database Design
        - o Entity Relationship Model
    - ➢ Process Design –Data Flow Diagrams (Optional)
    - ➢ Object Oriented Design – UML Diagrams
        - o Activity Diagram
        - o Sequence Diagram
        - o Use Case Diagram
    - ➢ Input Design
    - ➢ Output Design
11. **Chapter 4: System Environment**
    - ➢ Introduction
    - ➢ Software Requirements Specification
    - ➢ Hardware Requirements Specification
    - ➢ Tools, Platforms
        - o Front End Tool
        - o Back End Tool
        - o Operating System

12. Chapter 5 System Implementation

- ➢ Introduction
- ➢ Coding
  - o Sample Codes (core forms)
  - o Code Validation and Optimization

13. Chapter 6 System Testing

- ➢ Introduction
- ➢ Unit Testing
- ➢ Integration Testing
- ➢ System Testing
  - o Test Plan & Test Cases

14. Chapter 7 System Maintenance

- ➢ Introduction
- ➢ Maintenance

15. Chapter 8 Future Enhancement and Scope of further Development

- ➢ Introduction
- ➢ Merits of the System
- ➢ Limitations of the System
- ➢ Future Enhancement of the System

Chapter 9 Conclusion

Chapter 10 Bibliography

Appendix (Coding 5-8 pages & screen shots)

Glossary

The project report should be hardbound; should consist of a Contents page; all pages of the report should be numbered; content should be well organized in a meaningful manner; printouts of text & screen layouts should be original and should not be Xeroxed)

Annexure 9 : MCACS401 -Seminar Report Format

Each student is required to prepare a comprehensive report about the seminar. The report should contain a minimum of 15 pages describing the topic selected. The report should be in the format as described below.

I. **CONTENTS:**

The seminar report material should be arranged as follows:

1. Cover Page
2. Certificate
3. Acknowledgment
4. Abstract (one page)
5. Table of Contents
6. Chapters
7. Appendices
8. References

II. **PAGE DIMENSION AND BINDING SPECIFICATIONS:**

The seminar report should be A4 in size. The seminar report should be **spirally bound & white in color.** Two copies of the report (hard copy only) should be submitted in the prescribed format

III. **TYPING INSTRUCTIONS:**

One and a half line spacing should be used for typing the general text. The general text shall be justified and typed in the Font style 'Times New Roman' and Font size 12. **Subheading shall be typed in the Font style 'Times New Roman' and Font size 12 and bold. Heading** shall be typed in the Font style 'Times New Roman' and Font size 14 and **bold.**

IV. **FORMAT:**

Cover Page

TITLE OF SEMINAR

<Font Size 22><BOLD><Centralized>

Seminar Report

<Font Size 14>><BOLD><Centralized>

Submitted by

<Font Size 14><Italic>><BOLD><Centralized>

NAME OF THE CANDIDATE

<Font Size 16>><BOLD><Centralized>

in partial fulfillment for the award of the degree

of

<Font Size 14><1.5 line spacing><Italic>><BOLD><Centralized>

MASTER OF COMPUTER APPLICATIONS

AT



NAME & ADDRESS OF THE COLLEGE

Certificate

CERTIFICATE

<Font Size 16><BOLD><Centralized>

This is to certify that the Seminar entitled "***SEMINAR TITLE***" has been submitted by **STUDENT NAME, Register Number , Semester V** in partial fulfillment of the degree of Master of Computer Applications of Union Christian College (Autonomous) during the period 20__ - ___

<Font Size 14>><1.5 line spacing><Justified>

Date:

Place:

<Font Size 14>><1.5 line spacing><Left Alignment>

<Name of the guide >
Faculty Guide

< Name of HOD>
HOD, MCA

Acknowledgement

One page Acknowledgement typed with 1.5 line spacing, Font Style Times New Roman and Font Size 14.

Abstract

Abstract should be one page synopsis, it should summarize the aims, conclusions and implications of the topic of your seminar, typed with 1.5 line spacing, Font Style Times New Roman and Font Size 14.

Table of Contents

The table of contents should list all material following it as well as any material, which precedes it. One and a half line spacing should be adopted. A specimen copy of the Table of Contents.

Chapters

The chapters may be broadly divided into 3 parts (i) Introductory chapter (ii) Main theme of the topic (iii) and Summary or Conclusions

Appendices

References

All references include title, publisher if it's a book, journal name, page number and edition if it's a journal and year of publication. (Format is shown below)

- **Magazine & Newspaper Articles**

Format: Author's last name, first initial. (Publication date). Article title. *Periodical title, volume number(issue number if available)*, inclusive pages

Examples: Harlow, H. F. (1983). Fundamentals for preparing psychology journal articles. *Journal of Comparative and Physiological Psychology, 55*, 893-896.

- **Online periodical:**

Format:

Online periodical:

Author's name. (Date of publication). Title of article. *Title of Periodical*, volume number, Retrieved month day, year, from full URL

Online document:

Author's name. (Date of publication). *Title of work*. Retrieved month day, year, from full URL

Examples:

Devitt, T. (2001, August 2). Lightning injures four at a music festival. *Why? Files*. Retrieved January 23, 2002, from http://whyfiles.org/137lightning/index.html

Dove, R. (1998). Lady freedom among us. *The Electronic Text Center*. Retrieved June 19, 1998, from Alderman Library, University of Virginia website: http://etext.lib.virginia.edu/subjects/afam.html

Annexure 10 : MCACP402 -Project Guidelines

The Master of Computer Applications (MCA) programme prepares the students to take up positions as Systems Analysts, Systems Designers, Software Engineers, Programmers, mobile/web developers and Project Managers in any field related to information technology. As part of the curriculum, all students who are into their fourth semester will have to carry out a project preferably in the software industry or any research organization for the duration of one full semester. The objective of the MCA project work is to develop a quality software solution. During the development of the project, the student should be involved in all the stages of the software development life cycle like requirements engineering, systems analysis, systems design, software development, testing strategies, and documentation with an overall emphasis on the development of reliable software systems.

The primary emphasis of the project work is to understand and gain knowledge of the principles of software engineering practices, so as to participate and manage large software engineering projects in the future. Students should take this project work very seriously, and carry out the same individually.

This project should be taken as an opportunity to develop software, which gives exposure to SDLC. Topics selected should be complex and large enough to justify as MCA project. The project should be genuine and original in nature and should not be copied from anywhere else. If found copied, the project report will be forwarded to the Exam Discipline Committee as an Unfair means case for necessary action. Students should strictly follow and adhere to the project guidelines.

- Not more than one student is permitted to work on a project.
- Each student should be involved in each and every phase of Project Development. If it is found that the student is not involved in any phase; for example, the coding phase, it may lead to the rejection/disqualification of the project at any stage.
- The title of the project should be kept the same throughout the project (from guide approval until the final submission of the project).

Project Report

All the candidates of the MCA final project are required to submit a project report based on the work done by him/her during the project period. The important specifications are as follows.

- The report must contain 100 to 120 pages.
- The cover should be in a Navy blue color.
- The front format will be given from the college.
- Font & size - Times New Roman & 12 pt.
- Heading (14 pt Bold)and subheading. (12 pt Bold)
- Include Page numbers in the bottom center

It should have the following contents in the prescribed format

- **Cover Page** *as per format* **(See Annexure 10.1)**
- **Bonafide Certificate** *as per format* **(See Annexure 10.2)**
- **Certificate of the Head Of Department** *as per format* **(See Annexure 10.3)**
- **Certificate of the Internal project guide** *as per format* **(See Annexure 10.4)**
- **Certificate of the Company/Organization (Attach the original copy)**
- **Declaration by student** *as per format* – **(See Annexure 10.5)**
- **Acknowledgment**
- **Table of Contents**

  Please use the MS Word Table of content feature for this and not a manual TOC.
- **Abstract**

  This should describe the problem and the solution given by your project in brief. Limit the description to 1-2 pages.
- **Chapter 1 Introduction**

- *Introduction*
- *Problem Statement*
- *Scope and Relevance of the Project*
- *Objectives*

- **Chapter 2 System Analysis**
  - *Introduction*
  - *Existing System*
    - *Limitations of Existing System*
  - *Proposed System*
    - *Advantages of the Proposed System*
  - *Feasibility Study*
    - *Technical Feasibility*
    - *Operational Feasibility*
    - *Economic Feasibility*
  - *Software Engineering Paradigm Applied*

- **Chapter 3 System Design**
  - *Introduction*
  - *Database Design*
    - *Entity-Relationship Model*
    - *Data Dictionary*
  - *Process Design –Dataflow Diagrams (Optional)*
  - *Object-Oriented Design – UML Diagrams (include maximum you can)*
    - ✔ *Activity Diagram*

- ✔ *Class Diagram*
- ✔ *Communication Diagram*
- ✔ *Component Diagram*
- ✔ *Composite Structure Diagram*
- ✔ *Deployment Diagram*
- ✔ *Information Flow Diagram*
- ✔ *Interaction Diagram*
- ✔ *Object Diagram*
- ✔ *Package Diagram*
- ✔ *Profile Diagram*
- ✔ *Sequence Diagram*
- ✔ *State Machine Diagram*

❖

- ❖ Modular Design
  - ➢ Structure Chart
  - ➢ Modules Description
- ❖ Input Design
- ❖ Output Design

❖ **Chapter 4 System Environment**

- ❖ Introduction
- ❖ Software Requirements Specification
- ❖ Hardware Requirements Specification
- ❖ Tools, Platforms
  - ➢ Front End Tool
  - ➢ Back End Tool
  - ➢ Operating System

❖ **Chapter 5 System Implementation**

- ❖ Introduction
- ❖ Coding
  - ➢ Coding Standards
  - ➢ Sample Codes
  - ➢ Code Validation and Optimization
- ❖ Debugging
- ❖ Unit Testing
  - ➢ Test Plan & Test Cases

❖ **Chapter 9 System Planning and Scheduling**

- ❖ Introduction

- Planning a Software Project
  - ➢ Steps Involved in Planning a System
- GANNT Chart
- PERT Chart

- **Chapter 10 System Cost Estimation**
  - Introduction
  - LOC Based Estimation / Function Point based Estimation
  - (Specify anyone used for estimation)

- **Chapter 6 System Testing**
  - Introduction
  - Integration Testing
  - System Testing
    - ➢ Test Plan & Test Cases
- **Chapter 7 System Maintenance**
  - Introduction
  - Maintenance
- **Chapter 8 System Security Measures**
  - Introduction
  - Operating System-Level Security
  - Database Level Security
  - System-Level Security
- **Chapter 11 Future Enhancement and Scope of further Development**
  - Introduction
  - Merits of the System
  - Limitations of the System
  - Future Enhancement of the System
- **Annexure :**
  - Organization profile
  - Give a brief background of the organization where the student has developed the project
  - Document Glossary, Figures, Tables
    - ➢ A list of abbreviations should be provided in the document glossary. Each figure and the table should be labeled. You should create an index for these like the table of contents.
  - References :
    - ➢ Books: Any references you made to books and papers should be listed here with the book name, edition, name of author, and publisher.
    - ➢ Websites: Any references you made to websites should be listed here with the URL and date of access.

- ❖ User Interview Questionnaires
- ❖ Sample Project code / Algorithm if the project code is not available**.**

***** *Students who have done their project for any organization are permitted to attach detailed algorithms/specifications instead of code, in case the organization doesn't permit them to attach the code. The student needs to attach a letter in the project report from the Project Manager of the project in the organization that they are not permitting students to attach the code. In the absence of such a letter, the student needs to attach the code compulsorily.*

The project report should be hardbound; should consist of a Contents page; all pages of the report should be numbered; content should be well organized in a meaningful manner; printouts of text & screen layouts should be original and should not be Xeroxed.

Format of certificates to be attached in the project report

Annexure 10.1

A Project Report

On

"PROJECT TITLE"

Submitted to the

Department of MCA

In partial fulfillment of the

MASTER OF COMPUTER APPLICATIONS

Under the guidance of

<Internal Guide's Name>

Project Done by

<NAME OF STUDENT>

Reg No: <---------->

<EMBLEM OF COLLEGE>

DEPARTMENT OF MCA

< NAME AND ADDRESS OF COLLEGE >

Month-Year

Annexure 10.2

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

BONAFIDE CERTIFICATE

Certified that the Project Work entitled

"PROJECT TITLE"

is a bonafide work done by

Name of the student

In partial fulfillment of the requirement for the Award of

MASTER OF COMPUTER APPLICATIONS

Degree From

Union Christian College(Autonomous)

(Period of study)

Head of the Department **Project Guide**

Submitted for the Viva-Voce Examination held on.....

External Examiner1 ***External Examiner2***

(Name & Signature) ***(Name & Signature)***

Annexure 10.3

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

CERTIFICATE

This is to certify that the project entitled "PROJECT TITLE" has been successfully carried out by NAME OF STUDENT (Reg. No:) in partial fulfilment of the Course Master of Computer Applications.

INTERNAL GUIDE

Date: **HEAD OF THE DEPARTMENT**

Annexure 10.4

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

CERTIFICATE

This is to certify that the project entitled "PROJECT TITLE" has been successfully carried out by NAME OF STUDENT (Reg no:) in partial fulfilment of the course Master of Computer Applications under my guidance .

Date: **Name of Guide**

INTERNAL GUIDE

Annexure 10.5

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

DECLARATION

I, NAME OF STUDENT, hereby declare that the project work entitled "NAME OF THE PROJECT" is an authenticated work carried out by me at XYZ SOFTWARE PVT. LTD. under the guidance of Guide's Name for the partial fulfilment of the course MASTER OF COMPUTER APPLICATIONS. This work has not been submitted for similar purpose anywhere else except to NAME OF COLLEGE.

I understand that detection of any such copying is liable to be punished in any way the school deems fit.

NAME OF STUDENT

Signature

Date:

Place: