MAHATMA GANDHI UNIVERSITY

KOTTAYAM

MASTER OF COMPUTER APPLICATIONS

REGULAR (2 YEARS)

SCHEME ,SYLLABUS & REGULATIONS

FOR

AFFILIATED COLLEGES

(FROM 2020 ADMISSION ONWARDS)

Course Content

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**	**OS Fundamentals**-Operating system functions, Different types of OS, Comparison between windows & Linux operating system,	**4**

	system and DBMS	Compiler, Assembler and Interpreter, **Introduction to DBMS**Database, Table, Field, Row, Domain	
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		Continual Evaluation (Marks)	University Evaluation (Marks)	Total Marks	No. of Credits
		L	P				
MCA CT 101	Mathematical & Statistical foundation for Computer Applications	4	-	25	75	100	4
MCA CT 102	Digital Logic & Computer Organization	4	-	25	75	100	4
MCA CT 103	Structured programming in C	4	-	25	75	100	4
MCA CT 104	Software Engineering and Object oriented modeling	4	-	25	75	100	4
MCA CT 105	Database technology and NoSql	4	-	25	75	100	4
MCA CP 106	Database technology Lab(Mysql & Mongodb)		4	25	75	100	2

MCA CP 107	**Software Development Lab- I (C programming)**	**-**	**4**	**25**	**75**	**100**	**2**
MCA CT 108	**Employability Skill Training- Phase 1**	**2**	**-**	**50**	**0**	**50**	**1**
Total		**22**	**8**			**750**	**25**

Course Code	Course Title	Total Credits
MCA CT 101	**Mathematical & Statistical foundation for Computer Applications**	**4**

Course Objectives

The course aims to :

1. Explain the underlying concepts and tools in Discrete Mathematics with emphasis on their applications to Computer Science.
2. Familiarize the students with the scope and applications of Statistical theory in Computer Applications.
3. 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,	8
	Indirect and contradiction. **Predicate calculus**: Predicates, statement functions, variables and quantifiers, predicate formulas, free and bound variables, the universe of discourse.	
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 errorsprocedure for testing hypothesis **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	11

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 **Learning Outcomes**

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

- understand the basics of Set theory, Relations and Functions and their application in the Computer Science field
- apply the Rules of inference to solve applied problems.
- be familiar with the basic concepts of Probability Theory and Sampling Techniques.
- design a Probability model/ test of significance to solve a real-world problem.

Course Code	Course Title	Total Credits
MCA CT 102	**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 organisation
- 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), Bidirectional shift register, Universal shift registers.	10
3	**Processing Unit Concepts**	10
	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,Fast Multiplication, IEEE Representation of Floating point Numbers. **Processing Unit** - Instruction execution cycle, Sequencing of control signals, Hardwired Control, Microprogrammed Control, Control Signals, Microinstructions, Microprogram Sequencing, Branch Address Modification **RISC:** RISC characteristics and CISC characteristics	
4	**Main Memory And I/O Organization** **Main Memory** - Memory Hierarchy: Main memory, RAM : Semiconductor RAM memories, ROM , Cache Memory, Secondary memory, Performance Considerations, Virtual Memory, Memory Management Requirements, **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, Controlling Device Requests, Exception, Use of Interrupts in OS. **Direct memory access (DMA)**: DMA operations, Bus Arbitration, Buses, Interface Circuits, Standard I/O Interface: USB.	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 **Multiprocessors**–Structure, Interconnection Networks, Memory Organization **Pipelining** – Basic Concepts of pipelining,Arithmetic pipelining, Instruction Pipelining, Hazards **Advanced Concepts** - Instruction-level parallelism, Superscalar, Superpipelined, Multicore Systems	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

Learning Outcomes

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

- to do arithmetic operations on binary and understand different binary codes used in communication.
- At the end of the course,students will be able to perform the analysis and design of various digital electronic circuits.
- Students will be able to understand the internal organization of computers, memory units.
- Students will get knowledge about advanced computer architecture.

Course Code	Course Title	Total Credits
MCA CT 103	**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 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).	10
	Structures And Unions: Defining A Structure, Processing A Structure, User Defined Data Types, Structure And Pointers, Passing Structure To Function, Selfreferential Structures, And Union	
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 2_{nd} Edition, Prentice Hall Of India (2015).
4. Computer Basics And Programming In C, Rajaraman V, Phi
5. Understanding Pointers In C, Yashavant Kanetkar ,5_{th} Edition, Bpb Publication (2009)
6. Programming In C, Pradip Dey, Manas Ghosh , 2_{nd} Edition, Oxford Higher Education (2012)

Learning Outcomes

On completion of the course, the students will be

- Having a deep knowledge in application-oriented C programming features.
- Able to solve problems and implement it using various programming constructs.
- Identify the significance of C language as a very strong programming foundation.

Course Code	Course Title	Total Credits
MCA CT 104	**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.	10
	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).	
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

Learning Outcomes

- At the end of this Course, the participants may get basic insights into the need and importance of software engineering
- After completing this course, the Participants will get familiar with the activities in different phases of software engineering
- After completing the course, the participants will get familiarized with the basics of UML tools used for object oriented modeling

Course Code	Course Title	Total Credits
MCA CT 105	**Database Technology and NoSql**	**4**
Course Objectives		

This course aims to:

- Introduces the basic concepts of a database system and query language.
- Emphasizes the understanding of the fundamentals of relational database systems including data models, database architectures, database manipulations and normalization.
- Provides an understanding of new developments and trends such as distributed database, replication, fragmentation and NoSQL.

Module No.	Title & Contents	No. of Sessions
1	**Overview of Database Systems**: A Historical Perspective, Files System versus a DBMS, Advantages of a DBMS. Describing and Storing Data in a DBMS : The Relational Model, Levels of Abstraction in a DBMS, Data Independence. Structure of a DBMS. **Introduction to Database Design**: Entities, Attributes and Entity Sets. Relationship and relationship sets. Additional Features of the ER Model.	8
2	**Relational Model:** Introduction to the Relational Model. Integrity Constraints over	
	Relations: Primary Key, Foreign Key and General Constraints. E-R Model to Relational Model: Entity Sets to Tables, Relationship Sets to Tables, Translating Relationship Sets with Key Constraints. Translating Relationship Sets with Participation Constraints, Translating Weak Entity Sets.	8
3	**Structured Query Language** Overview of SQL, Basic Queries in SQL, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, String and Date Functions, Complex Integrity Constraints in SQL, Triggers and Views in SQL, Embedded SQL, Dynamic SQL and Cursors.**Relational Database Design** Introduction to Schema Refinement, Functional Dependencies, Normal Forms: First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form.	14
4	**Transaction Management, Concurrency Control, Distributed System -** The ACID Properties of a Transaction, Concurrent Execution of Transactions: Serialisability, Anomalies Due to Interleaved Execution, Schedules Involving Aborted Transactions, Lock-Based Concurrency Control: Strict Two-Phase Locking (Strict 2PL), Deadlocks. Introduction to Crash Recovery: Stealing Frames and Forcing pages, overview of ARIES. Dealing with Deadlocks. **Introduction to Distributed Database** - Distributed DBMS Architectures, Storing data in a Distributed Databases: Replication, Fragmentation.	10

5	**Nosql Data Management** - Introduction to NoSQL- Four types of NoSQL Databases - Aggregate data models - Aggregates – Key-Value and Document Data Models – Relationships – Graph Databases – Schemaless Databases – Materialized views – Distribution Models – Sharding – Master-Slave Replication – Peer-Peer Replication.	8

Text Books & References

1. Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Database Systems: Design, Implementation and Management, Peter Rob, Thomson Learning, 7Edn.
4. Concept of Database Management, Pratt, Thomson Learning, 5Edn.
5. Database System Concepts , Silberchatz, Korth and Sudarsan, Fifth Edition, McGraw Hill, 2006
6. The Complete Reference SQL, James R Groff and Paul N Weinberg, Second Edition, Tata McGraw Hill, 2003.

Learning Outcomes

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

- Describe the architecture and functioning of Database Management Systems.
- Apply the principles of data modeling using Entity Relationship and develop a good database design.
- Create and maintain a relational database using SQL and its advanced features.
- Apply Normalization techniques to normalize a database.
- Illustrate the techniques for controlling the consequences of concurrent data access and crash recovery.
- Describes how aggregates manifest themselves in data models in NoSQL

Course Code	Course Title	Total Credits
MCA CP 106	**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	**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** a) Row insertion, deletion and updating. b) Save using COMMIT. c) Inserting Table rows with a subquery. d) Restoring table contents (Rollback). **Basic SELECT statements** a) Simple select query	14
	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.	
3	**Joining database tables & SQL Functions**	

	a) Joining Tables ● Joining tables with an alias. ● 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.**	13
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. ➢ How to take backup and restore	

**** 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).

Learning Outcomes

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

- Create and alter table structures using MySQL.
- Formulate queries to perform Insert, update and delete, select and rollback operations in a database.
- 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
MCA CP 107	**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. ● Demonstration of various file operations. (Hint: Text file) ● Implementation of character counting, line counting and word counting for a file.	9
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)

Learning Outcomes

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

- Select and model data using primitive and structured types.
- Construct programs that demonstrate effective use of C features including arrays, structures & Pointers
- Handle various sorting and searching techniques.
- Create and manipulate Files using various file handling functions.
- Design and implement an application for a given problem domain.

Course Code	Course Title	Total Credits
MCA CT 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. The 7 Habits of Highly Effective People – Stephen R. Covey 3. The Leader Who Had No Title - Robin Sharma	2
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.	30
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/**

Learning Outcomes

By successfully completing this course, students will be able to

- Do self-assessment of strengths and weaknesses; identify what is lacking for a better personality and improve on it.
- Solve Quantitative, Verbal and Logical Reasoning and Comprehension problems in IT recruitment drives and other competitive exams.
- Organize and write an effective Cover Letter and Resume.

Course Content -Semester 2

Course Code	Course Title	No of hours per week		Continual Evaluation (Marks)	University Evaluation (Marks)	Total Marks	No. of Credits
		L	P				
MCA CT	Optimization Techniques for Computer Applications	**4**	**-**	**25**	**75**	**100**	**4**
201							

MCA CT 202	Data structures and Algorithm Analysis	**4**	**-**	**25**	**75**	**100**	**4**
MCA CT 203	Computer Networking with TCP/IP	**4**	**-**	**25**	**75**	**100**	**4**
MCA CT 204	Data Science & Big data Analysis	**4**	**-**	**25**	**75**	**100**	**4**
MCA CP 205	Object oriented Lab(Java Lab)	**-**	**6**	**25**	**75**	**100**	**3**
MCA CP 206	Software development lab-II (PHP)	**-**	**4**	**25**	**75**	**100**	**2**
MCA CP 207	Data structures Lab using C	**-**	**4**	**25**	**75**	**100**	**2**
Total		**16**	**14**			**700**	**23**

Course Code	Course Title	Total Credits
MCA CT 201	**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	7
	Introduction to Linear Programming-Mathematical formulation of Linear Programming Problem, Graphical solution, special cases of graphical method	
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, processing n jobs through 3 machines.	10

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

Learning Outcomes

At the end of this Course, the participants

i) may get basic insights into Applications of Operations Research in Managerial Decision Making.

ii) will get familiar with Scientific Tools and Models in OR for analysing the Business. iii) will be able to understand the basics of Decision Science.

Course Code	Course Title	Total Credits
MCA CT 202	**Data structures and Algorithm Analysis**	**4**

Course Object ives

- 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 be familiarized with various algorithm design strategies.
- To choose the appropriate data structure and algorithm design method for a specified 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. **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, Deque, Priority queue, Application of queues.	10
2	**Linked List**: Singly linked list- Insertion, deletion, traversing and searching. Linked stacks and queues, Doubly linked list- Insertion, deletion, Traverse and Search operations. **Trees** : Basic terminology, binary trees, binary tree representation, algebraic expressions, binary tree traversals, Binary Search Tree –Insertion and Searching, Balanced Trees – AVL Tree. **Graphs**: Terminology and representations, Traversals- BFS, DFS.	10
3	**Searching and Sorting:** Searching – Linear search, Binary search, Comparison of both methods. **Sorting** – Insertion, Selection, Heap, Radix, Comparison of various sorting methods. **Hashing**: Hashing Concept, Hash functions, Collision Resolution	8
4	**Divide and Conquer method** – General method, Finding the maximum and minimum, Analysis of Binary search, Quick sort and Merge sort. **Greedy Method**– The general method, Knapsack Problem, Minimum cost spanning tree- Prim's algorithm and Kruskal's algorithm.	10

5	**Dynamic programming Method**- General method, Multistage graphs, All pairs shortest paths. **Backtracking:**-The general method, The 8-Queens problem. **Branch and Bound**-General Method, Least Cost search, control abstraction for LC search. Lower Bound Theory- Comparison Trees for Ordered searching, Sorting.	10

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. Fundamentals of computer algorithms- Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajeshekharan (Universities Press , 2008)
5. Data Structures – a pseudocode approach with C –Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn., Cengage Learning C 2005
6. Data Structures Through C in Depth, S.K. Srivastava, Deepali Srivastava, (BPB Publications, 2003).

Learning Outcomes

After completing this course the students will

- Have deep knowledge about the organization of data structures, Arrays, Linked Lists, Stacks, Queues, Trees and Graphs.
- be able to select the appropriate data structures for solving the given problem.
- be familiar with different sorting and searching methods and their features.
- Know the various algorithm design strategies and their applications. Thus will be able to choose the more suitable method for the given scenario.
- Know how to analyze the performance of devised algorithms using different analysis methods.

Course Code	Course Title	Total Credits
MCA CT 203	**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
- To understand the basic concept of socket programming and client server model.

Module No.	Title & Contents	No. of Sessions

1	**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	8
2	**Wired LAN: IEEE** Standards-Frame Format-Addressing-Ethernet evolution. **Wireless LANS**: IEEE802.11, MAC Sub layer, Addressing Mechanism, Bluetooth- Architecture, Frame format, **Switched WANS**: X.25, ATM-ATM Architecture, ATM Layers.	10
	Network Layer: Introduction, Switching-Circuit switching, Packet switching, connection oriented and connectionless service, services provided by network layer.	
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 state update packet, Path vector routing, **BGP –** external and Internal BGP , Types of packets	12
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.	8

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.

Learning Outcomes

After completing this course the student must demonstrate the knowledge and ability to:

- Understand about basic computer network terminologies.
- Enumerate the layers of the OSI model and TCP/IP model and can explain the function(s) of each layer.
- Understand about subnetting and routing mechanisms.
- Identify the different protocols in TCP/IP and how they help in Internet communication.

Course Code	Course Title	Total Credits
MCA CT 204	**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 PatternGrowth 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	10
	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.	
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, NonRelational 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

Learning Outcomes

At the end of this Course, the participants

- may get basic insights into Applications of Big Data concepts.
- will get familiar with Scientific Tools and Models in Data Science.
- will be able to understand the basics of Different tools used in Big Data Analysis.

Course Code	Course Title	Total Credits
MCA CP 205	**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 the 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/

Learning Outcomes

On completion of the course,

- The student will be able to understand the applications of Object Oriented Programming concepts
- The students will illustrate the package concept and handling error mechanism in java
- The students will be able to understand GUI programming through database connectivity

Course Code	Course Title	Total Credits
MCA CP 206	**Software development lab-II (PHP)**	**2**

Course Objectives

v) To understand the general concepts of PHP scripting language for the development of Internet websites. vi) To understand the basic functions of MySQL database program. vii) To learn the relationship between the client side and the server side scripts. viii) To develop a basic understanding about software development framework. ix) To understand the concepts of semantic web and web hosting.

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.	10
2	**PHP Forms**: Form handling, form validation, form required, Form Complete, Date and time, Cookies, Sessions. **File Handling in PHP, File Upload, Sending Email.**	12
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	**JavaScript**- Variables, Operators, Functions, Event Handling, Form Validation using JavaScript. **AJAX**- submitting a section of a page using AJAX	6
5	**Introduction to PHP frameworks**- Introduction to MVC architecture, Laravel, Basic features, Creating projects using Laravel, Mini Project. **Introduction to Semantic Webs:-** What is semantic web?, RAP: RDF API for PHP. **Introduction to Web Hosting**: Demonstration of how to host a php project on a server	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. Official Laravel Documentation https://laravel.com/docs/7.x
5. https://www.phptpoint.com/laravel-tutorial/
6. https://www.tutorialandexample.com/creating-first-laravel-project/
7. http://wifo5-03.informatik.uni-mannheim.de/bizer/rdfapi/tutorial/introductionToRAP.htm 8. https://o7services.com/blog/2019/12/21/upload-php-project-on-server-php

Learning Outcomes

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

- Define the basic fundamentals of PHP
- Understand the concept of Semantic web and web hosting.
- Differentiate between client-side validation and server-side validation
- Apply Oops concepts in PHP
- Create database and establish connection using PHP
- Develop web applications using advanced PHP frameworks.

Course Code	Course Title	Total Credits
MCA CP 207	**Data structures Lab using C**	**2**

Course Objectives

This course aims to:

- Develop skills to design simple linear and nonlinear data structures
- Be capable to identity the appropriate data structure for a given problem ·
- Have practical knowledge on the applications of data structure

Module No.	Title & Contents	No. of Sessions
1	**Arrays, Stacks and Queues:** ● Demonstrate polynomial addition. ● Implementation of stack ● Conversion of an infix expression to postfix expression ● Evaluating a postfix expression ● Implementation of linear queue. ● Implementation of circular queue.	16

2	**Linked List, Trees** ● Implementation of linked list and performing insertions and deletions at both ends and also in between ● Implementation of linked stack ● Implementation linked queue ● Implementation of a doubly linked list ● Creation of binary tree and binary search tree and performing the traversals	26
3	**Searching and Sorting** ● Demonstrate linear search and binary search. ● Demonstrate various sort algorithms – insertion sort, merge sort, quick sort and heap sort	6

**** Lab manual is attached as Annexure 5***

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). **Learning Outcomes**

On successful completion of the course, students will be able to ●
Implement linear and non-linear data structures.

- Apply data structures such as stack, queue, linked lists and tree to solve various computing problems.
- Implement different searching and sorting techniques

Course Content -Semester 3

Course Code	Course Title	No of hours per week		Continual Evaluation (Marks)	University Evaluation (Marks)	Total Marks	No. of Credits
		L	P				
MCA CT 301	Machine Learning Techniques	**4**	**-**	**25**	**75**	**100**	**4**
MCA CT 302	Cyber Forensics	**4**	**-**	**25**	**75**	**100**	**4**
MCA ET 303	Elective-1	**4**	**-**	**25**	**75**	**100**	**4**
MCA ET 304	Elective-2	**4**	**-**	**25**	**75**	**100**	**4**
MCA CT 305	Python Programming for Data Science		**4**	**25**	**75**	**100**	**2**
MCA CP 306	Advance Operating System Lab using Linux	**-**	**4**	**25**	**75**	**100**	**2**

MCA CP 307	Mini Project	**-**	**4**	**100**	**-**	**100**	**2**
MCA CT 308	Employability Skill Training-Phase 2	**2**	**-**	**50**	**0**	**50**	**1**
Total		**18**	**12**			**750**	**23**

Elective 1	
MCA 303_ET1	Artificial Intelligence
MCA 303_ET2	Enterprise Resource Planning
MCA 303_ET3	Computer Graphics And Multimedia
MCA 303_ET4	Digital Image Processing

Elective 2	
MCA 304_ET1	Cloud computing
MCA 304_ET2	Cryptography and Network Security
MCA 304_ET3	Business Management And Information System
MCA 304_ET4	Internet of Things (IoT)

Course Code	**Course Title**	**Total Credits**
MCA CT 301	**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, Bayes decision theory-Introduction, Classification, Discriminant functions, Parametric method-Maximum Likelihood estimation, Regression, Multivariate Data, Parameter Estimation, Decision trees- Univariate Trees, Pruning, Nearest Neighbor Classification, Support Vector Machines	12
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.	5+5
4	**Clustering** Introduction, Similarity measures, Clustering criteria, Distance functions, k-Means Clustering, Hierarchical clustering, DBSCAN **Combining Multiple Learners** Voting, Bagging, Boosting	5+3
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	10

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.

Learning Outcomes

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

- ➢ Recognize the characteristics of machine learning that make it useful to real-world problems.
- ➢ Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.

- ➢ Understand how to use feature extraction and classification techniques.
- ➢ Understand how to use clustering techniques.
- ➢ Understand the concepts of NN and how to build a model using ANN.

Course Code	Course Title	Total Credits
MCA CT 302	**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, 3 rd 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

Learning Outcome

At the end of this Course, the students will be able to

- get a basic idea in Computer forensics
- Understand the importance of a systematic procedure for investigation of data found on various digital media
- Understand the various forms of computer crimes ● Understand the limitations imposed by cyber laws.

Course Code	Course Title	Total Credits
MCA 303_ET1	**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

Learning Outcomes

Upon completion the students will be able to

- Explore the importance and relevance of AI in various fields & to understand about the basic theory of problem solving paradigm
- To be familiar with searching strategies applied in artificial intelligence.
- Enumerate the Knowledge representation using Rule based Algorithms and Reasoning
- Introduce the ongoing research and application of Artificial Intelligence in different fields like Natural language processing, Expert systems and robotics.

Course Code	Course Title	Total Credits
MCA 303_ET2	**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 - Ecommerce 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

Learning 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 able to understand different technologies used for building ERP systems and different business modules associated with ERP system.

- 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
MCA 303_ET3	**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, ImageTypes, 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. **Learning 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
MCA 303_ET4	**Digital Image Processing**	**4**

Course Objectives

- To familiarize students with an overview of the basic concepts of Digital Image Processin g
- 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.

Learning 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
MCA304_ET1	**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 cloud engine, Multimedia Cloud, Energy aware Cloud computing, Jungle Computing.	8

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.

Learning Outcomes

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

- understand the fundamental concepts of Cloud Computing, cloud infrastructure and working of different service models and cloud deployment models.
- understand cloud architecture and Cloud virtualisation.
- aware about Data storage in cloud and about different cloud computing services.
- aware about the Security in cloud computing and different cloud computing tools.
- understand the cloud platforms used in industry, Clouds computing applications future directions and trends.

Course Code	Course Title	Total Credits
MCA304_ET2	**Cryptography and Network Security**	**4**

Course Objectives

The course aims to provide

1. Provide an understanding of data security using various cryptographic algorithms.
2. Enable students to identify the underlying network data security.
3. 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.

Learning 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
MCA304_ET3	**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, Ecommunication, E-collaboration, It Impact On Society, Impact Of It On Privacy, Ethics, Intellectual Property, Copyright, Patents. **Decision Making Process In Business Organisation**: Decision Making Process, Types Of Decisions, Selection Of Decision Alternatives, Four Ways Of Decision Analysis.	8

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

Learning 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
MCA304_ET4	**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).

Learning Outcomes

At the end of the course, the students will be able to

- 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
MCA CT 305	**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/

Learning Outcomes

At the end of this Course, the students

- will get the programming skills required to develop python application programs.
- will be able to develop web applications using the django framework.
- will learn Data handling using python.

Course Code	Course Title	Total Credits
MCA CP 306	**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	8
	Communication: utilities -mesg ,who-T ,talk, write ,wall ,finger,chfn,ping,traceroute,ftp, mail . **Linux login**: using Telnet,ssh.	
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

Learning Outcomes

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

- Run various Linux commands on a standard LINUX Operating system (Ubuntu flavor of the Linux Operating system is preferred)
- Manage Files and directories in Linux operating system
- familiarize process creation, scheduling task and work with networking utilities ● Master the basics of Linux administration ● Acquire the shell script writing skills.

Course Code	Course Title	Total Credits
MCA CP 307	**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

Learning Outcome

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

- 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
MCA CT 308	**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,	2
	Pronunciation, Voice Quality, Accent and Intonation. Body Language – Eye Contact, Facial Expression, Gestures, Posture and Body Movements. **Activity: Exercises on Listening and Speaking**	
3	**Group Discussion** Nature, Characteristics of Successful GD, Group Discussion Strategies, Techniques for Individual Contribution, Group Interaction Strategies, Practice Case Studies. **Activity: Group wise GD Training**	10

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

Learning Outcomes

- Understand all aspects of communication and its effect on giving and receiving information.
- Identify his/her analytical and lateral thinking, constructive argument capabilities, clarity of thoughts and capability to hold a discussion with a group.
- Understand the purpose of professional interviews.
- Articulate the importance of self-preparation.
- Students are able to practice their interviewing skills in an environment similar to an actual interview.

Course Content -Semester 4

Semester 4							
Course Code	**Course Title**	**No of hours per week**		**Continual Evaluation (Marks)**	**University Evaluation (Marks)**	**Total Marks**	**No. of Credits**
		L	**P**				

MCACS 401	Seminar	**3**		**50**	**-**	**50**	**2**
MCA CP 402	Main Project		**27**	**150**	**150**	**300**	**12**
MCA CV 403	Course Viva		**-**	**-**	**100**	**100**	**5**
Total						**450**	**19**

Course Code	Course Title	Total Credits
MCA CS 401	**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 10 (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.

Textbooks & References

Learning Outcome

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
MCA CP 402	**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. ➢ Difficulties faced in this phase.
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 respect before the external evaluators appointed by the university.

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

Learning Outcome

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
MCA CV 403	**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 evaluators duly appointed by the university 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 3rsd semester of MCA . 25 % of the total marks is set apart for this.

Learning Outcome

After the course viva, students will be able to

- 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	***Lab Record programs for MCA 106***
Annexure 2	***Lab Record programs for MCA 107***
Annexure 3	***Lab Record programs for MCA 205***
Annexure 4	***Lab Record Programs for MCA 206***
Annexure 5	***Lab Record Programs for MCA 207***
Annexure 6	***Lab Record Programs for MCA 305***
Annexure 7	***Lab Record Programs for MCA 306***
Annexure 8	***MCA 307 -Mini Project Guidelines***
Annexure 9	***MCA 401- Seminar Record Format***
Annexure 10	***MCA 402- Main Project Guidelines***

Annexure 1 : ***Lab Record programs for MCA 106***

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 MCA 107*

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 transpose of a matrix using 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 the 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 lab record and the same will be considered separately for external lab evaluation.

Annexure 3 : Lab Record Programs for MCA 205 (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: MCA 206 Lab Record Programs for PHP

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 minimum 30 programs including the mini project.

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 and client-side (JavaScript) 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 a program to send EMail using PHP.
8. Develop programs based on database connectivity using PHP (5)
9. Program to implement AJAX in PHP application
10. Mini project using Laravel framework

Annexure 5: Lab Record Programs for MCA 207 Data structures Lab using C

1. Write a program to perform polynomial addition using arrays.
2. Write a menu driven program to perform linear stack operations.
3. Write a program to convert an infix expression to a postfix expression using stack.
4. Write a program to evaluate a postfix expression using stack.
5. Write a menu driven program to perform linear queue operations.
6. Write a menu driven program to perform linear circular queue operations.
7. Write a menu driven program to create a singly linked list and to perform insertion at the beginning, at the end of the linked list, deletion of a node from the beginning and end of the list, and to traverse the list.
8. Write a menu driven program to create a singly linked list and insert and delete a node after the specified node.
9. Write a menu driven program to perform linked stack operations.
10. Write a menu driven program to perform linked queue operations.
11. Write a menu driven program to perform doubly linked list manipulations.
12. Write a menu driven program for implementing Binary tree traversals.
13. Write a menu driven program for creation of binary search tree and traversals.
14. Write a menu driven program to perform linear search and binary search.
15. Write a program to perform insertion sort.
16. Write a program to perform merge sort.
17. Write a program to perform a quick sort.
18. Write a program to perform heap sort.

Annexure 6: MCA 305 Python for data science lab programmes

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

Annexure 7: MCA 306- Linux Lab Record programs

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
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 8: MCA CP 307- 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 –Dataflow Diagrams (Optional)

➢Object Oriented Design – UML Diagrams

- o Activity Diagram o
- S equence 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 : MCA CS 401 -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:

1. **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

COLLEGE EMBLEM

NAME & ADDRESS OF THE COLLEGE

<Font Size 16>><1.5 line spacing><BOLD,Capital><Centralized>

MONTH- YEAR

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

2. <u>Certificate</u>

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 Mahatma Gandhi University, Kottayam 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

3. Acknowledgement

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

4. 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.

5. 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.

6. Chapters

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

7. **Appendices**
8. **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 : MCA CP 402 -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 of the University 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

1. **Cover Page** *as per format* **(See Annexure 10.1)**
2. **Bonafide Certificate** *as per format* **(See Annexure 10.2)**
3. **Certificate of the Head Of Department** *as per format* **(See Annexure 10.3)**
4. **Certificate of the Internal project guide** *as per format* **(See Annexure 10.4)**
5. **Certificate of the Company/Organization (Attach the original copy)**
6. **Declaration by student** *as per format* – **(See Annexure 10.5)**
7. **Acknowledgment**
8. **Table of Contents**

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

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

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

11. 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*

12. 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

13. Chapter 4 System Environment ➢ Introduction

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

14. Chapter 5 System Implementation

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

15. Chapter 9 System Planning and Scheduling

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

16. Chapter 10 System Cost Estimation

- Introduction
- LOC Based Estimation / Function Point based Estimation (Specify anyone used for estimation)

17. Chapter 6 System Testing

- Introduction
- Integration Testing
- System Testing ○ Test Plan & Test Cases

18. Chapter 7 System Maintenance

- Introduction
- Maintenance

19. Chapter 8 System Security Measures

- Introduction
- Operating System-Level Security
- Database Level Security
- System-Level Security

20. Chapter 11 Future Enhancement and Scope of further Development

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

21. 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

Mahatma Gandhi University, Kottayam

(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: