8. SYLLABUS FOR M.C.A. 1ST SEMESTER

PAPER: IT 11 : PROGRAMMING AND DATA STRUCTURES

Fullmarks:75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives

This course enables the students:

1.	To provide knowledge of practical implementations and usage of Data Structures and Algorithms
2.	Employ knowledge of various data structures during construction of a program.
3.	To develop the logical ability to store and retrieve data efficiently.
4.	To develop an appreciation of graph theory-based solutions for real life problems.
5.	Design and construct object-oriented software with an appreciation for data abstraction.

Course Outcomes

After the completion of this course, students are expected to

A.	Identify various data structures and their usages.
B.	Apply data structures in the modelling of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design.
C.	Demonstrate the usage of optimal trees, heaps and priority queues.
D.	Implement sorting algorithms.
E.	Apply data structures in the modelling of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design.

Module 01(Lecture 06)

Introduction to C, Identifiers and keywords, Data types, Declarations, Expressions, Statements and symbolic constants. Pre-processor command, # include, define, if def, Preparing and running a complete C Program. Operators and expressions, Library functions. Control statements.

Module 02 (Lecture 06)

Functions: Defining and accessing, passing arguments, Function prototypes, Recursion. Use of library functions, Strong classes: automatic, external and static variables, Arrays: Defining and processing, Passing to a function, Multi-dimensional arrays. Strings operations on strings.

Module 03(Lecture 06)

Pointer's declarations. Passing to a function. Operators on pointers. Pointers and arrays. Arrays of pointers. Structures: Defining and processing. Passing to a function. Unions. Data files: Open, close, creates, process. Unformatted data files.

Module 04(Lecture 10)
Fundamental Data Structures: Using Arrays, Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, Asymptotic Analysis.
Stacks, Queues, Dequeues: The Stack, Queue, Dequeue ADTs, Simple Array Based Stack, Queue, Dequeue Implementation, Implementing Stack, Queue with Singly Linked List, Reversing an Array using Stack, Matching Parenthesis and HTML tags, A Circular Queue.

Module 05(Lecture 06)
Sorting: Merge sort, Quick sort, studying sorting through algorithmic lens, Comparing Sorting Algorithms.
Heap: Priority Queues, Array Implementation of Heaps, Construction of Heaps, Heap Sort

Module 06(Lecture 08)
Trees: General Trees, Binary Trees, Implementing Trees, Tree Traversal Algorithms, Binary Search Trees, AVL Trees, B Trees.
Graphs: Data Structures for graphs, Graph Traversals, Transitive Closure, Directed Acyclic
Graphs, Shortest Paths, Minimum Spanning Trees.

Text Books: -

1. E. Balaguruswamy, "Programming in ANSI C, 8th Edition, McGrow Hill,2019
2. Seymour Lipschuiz, “Data Structures with C”, 3rd Edition, McGrow Hill, Schaum's Series2017

Reference Books:-

1. Reema Thareja, “Programming in C”, latest Edition, Oxford,2018
2. Ashok N. Kamthane, “Introduction to Data Structures in C”, 1st Edition, Pearson,2009

PAPER : IT 12 : DATABASE MANAGEMENT SYSTEMS
Fullmarks:75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives
This course enables the students:

1.	An ability to apply knowledge of mathematics, science and engineering to develop and analyze computing systems.
2.	An ability to perform experiments to analyze and interpret data for different applications.
3.	An ability to design, implement and evaluate computer-based systems, processes, components or programs to meet desired needs within realistic constraints of time and space.
4.	An ability to analyze the local and global impact of systems /processes /applications /technologies on individuals, organizations, society and environment.
5.	An ability to function in multidisciplinary teams.

Course Outcomes

After the completion of this course, students are expected to

A.	Explain the basic concepts and the applications of database systems.
B.	Utilize the knowledge of basics of SQL and construct queries using SQL.
C.	Explain&usedesignprinciplesforlogicaldesignofdatabases,includingtheERmethodand normalization approach.
D.	Demonstrate the basics of query evaluation and apply query optimization techniques.
E.	Explain the basic concepts and the applications of database systems.

Module 01(Lecture 06)

Introduction: An example, Characteristics of Database approach, Advantages of using DBMS approach, A brief history of database applications, Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment, Centralized and client-server architectures, Classification of Database Management systems.

Module 02(Lecture 06)

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship types of degree higher than two.

Module 03(Lecture 08)

Relational Model and Relational Algebra: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and dealing with constraint violation, Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Relational Database Design Using ER- to-Relational Mapping.

Module 04(Lecture 08)

SQL, Data Definition and Data Types, Specifying basic constraints in SQL, Schema change statements in SQL, Basic queries in SQL, More complex SQL Queries. Insert, Delete and Update statements in SQL, Specifying constraints as Assertion and Trigger, Views (Virtual Tables) in SQL, Additional features of SQL, Database programming issues and techniques, Embedded SQL, Dynamic SQL, Database stored procedures and SQL /PSM.

Module 05(Lecture 08)

Database Design, Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. Multivalued and join dependencies, DKNF, Atomic values, Data-base Design Process. Modelling Temporal Data, Alternative approaches to database design.

Module 06(Lecture 06)

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions; Lock- Based Concurrency Control, Performance of locking; Transaction support in SQL,Introduction to crash recovery, Transaction State, Characterizing Schedules based on Recoverability and Serializability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Deadlock Handling, Recovery and Atomicity, Log-Based Recovery, Distributed

Databases and Client-Server Architectures: Concepts and Types of Distributed databases, data fragmentation, Replication and Allocation Techniques for Distributed Database Design, Query Processing in DistributedDatabases.

Text Book:

1. ElmasriRamez, &Navathe S.B., "Fundamentals of Database Systems", 7th Edition, Pearson Education,2016.
2. Peter Rob, Steven Morris & Carlos Coronel , "Data base Systems design, Implementation, and Management", 8th Edition, Cengage Learning2007.

Reference Book:

1. Silberschatz A., &Korth H., "Database Systems Concepts", 6th Edition, McGraw Hill Higher Education,2019.
2. C.J.Date , "Introduction to Database Systems", 8th Edition , Addison-Wesley,2003

PAPER : IT 13 : PYTHON PROGRAMMING

Full marks: 75, Pass Marks: 30, Time: 3 Hrs. Credits: 3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives

This course enables the students:

1.	To introduce Python programming language through its core language basics and program design techniques suitable for modern applications.
2.	To understand the wide range of programming facilities available in Python covering graphics, GUI, data visualization and Databases.
3.	To utilize high-performance programming constructs available in Python to develop solutions in real life scenarios.

After the completion of this course, students are expected to

A.	Design real life situational problems and think creatively about solutions of them.
B.	Apply a solution clearly and accurately in a program using Python.
C.	Apply the best features of Python to program real life problems

Module 01(Lecture 05)

Introduction to Python, history of python. Two modes of using Python Interpreter, Variables and Data Types, Operators and their Precedence, Strings & Slicing, Python Lists, tuples and set, Input from the Keyboard.

Module 02(Lecture 05)

Conditional statements in python if, elif, Loops and Iterations: while and for loops, Python Syntax, Colon & Indentation, Syntax of for loops, Jump statements: break and continue.

Module 03(Lecture 06)
Functions, passing arguments and return values. Optional and Named Arguments, Storing functions in modules. Modules and Packages in Python, Different ways to import Packages.

Module 04(Lecture 09)
Object Oriented Programming in Python, classes, creating and using a class. Working with classes and instances. Inheritance, importing classes, python standard library.

Module 05(Lecture 07)
File Input/output the pickle module, working with a file, File related modules in Python, File modes and permissions, Reading & Writing data from a file, redirecting output streams to files, working with directories, CSV files and Data Files, Exception Handling, Divide a zero error. Use of try except block, working with multiple files. Graphics, GUI, Writing GUI Programs.

Module 06(Lecture 10)
Arrays and Matrices, The NumPy Module, Creating Arrays and Matrices, Copying, Arithmetic Operations, Cross product & Dot product, Saving and Restoring, Matrix inversion & 3D Data Visualization, The Matplotlib Module, Multiple plots, Polar plots, Pie Charts, Plotting mathematical functions.

Text Books:

1. David Beazley & Brain K. Jones, Python Cookbook, 3rd edition, O' Reilly,2013.
2. 2. Yashavant Kanetkar & Aditya Kanetkar, Let Us Python, 2nd edition, BPB,2020.

Reference Books:

1. Mark Summerfield, Programming in Python 3, 2nd edition, Pearson Education, 2010
2. Martin C. Brown, Python the Complete Reference, 1st edition ,Mc Graw Hill,2018.

PAPER : IT 14 : COMPUTER ORGANISATION AND ARCHITECTURE
Fullmarks: 75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives
This course enables the students:

1.	To provide knowledge of Computer Architecture
2.	Employ knowledge of various Digital Logic Circuits, Data Representation, Registerand Processor level Design and Instruction Set architecture
3.	To develop the logical ability to Determine which hardware blocks and control lines are used for specific instructions
4.	Understand memory organization, I/O organization and its impact on computer cost/performance.
5.	Know merits and pitfalls in computer performance measurements.

Course Outcomes
After the completion of this course, students are expected to

A.	Describe the merits and pitfalls in computer performance measurements and analyze the
	impact of instruction set architecture on cost-performance of computer design
B.	Explain Digital Logic Circuits, Data Representation, Register and Processor level Design and Instruction Set architecture
C.	Solve problems related to computer arithmetic and determine which hardware blocks and control lines are used for specific instructions
D.	Design a pipeline for consistent execution of instructions with minimum hazards
E.	Explain memory organization, I/O organization and its impact on computer cost/performance.

Module 01(Lecture 06)
Number system, Binary Arithmetic, Complements, Alphanumeric and EBCDIC Codes, Logic Gates, Boolean algebra, Canonical and Standard Forms, Karnaugh map, IEEE Standard Floating-Point Representation.

Module 02(Lecture 06)
Basic processing unit: Some Fundamental Concepts, Basic architecture of computer, Functional units, Operational concepts, Bus structures, Instruction code, Instruction set, Instruction Cycle & Execution Cycle, Instruction formats,

Module 03(Lecture 06)
General Register and Stack Organization, Addressing Modes, Data Transfer & Manipulation Programs, Program Control, Control unit: Micro programmed vs. Hardwired controlled unit, RISC vs CISC.

Module 04(Lecture 08)
Memory organization: Memory Hierarchy, RAM, ROM, Auxiliary Memory, Associative Memory, Cache memory organization, Mapping techniques, Virtual memory, Page Replacement. Inclusion, Coherence, and Locality.

Module 05(Lecture 06)
Input-output organization: Input-Output Interface, Interrupt, Modes of transfer: Programmed I/O, Interrupt Initiate I/O, Direct Memory Access (Initialization, Transfer and Controller), Input-Output Processor.

Module 06(Lecture 08)
Pipelining: Basic Concept of Pipeline Organization, Different types of Pipelining, Pipeline Performance Evaluation, Data Dependencies, Hazard and Techniques for overcoming or reducing the effects of various hazards, Superscalar and Superpipeline Design, Flynn's Classification, Parallel Architecture.

Text Books:

1. Mano.M., Computer System and Architecture, Revised 3rd Edition, PearsonEducation.
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 6thEdition, McGraw-Hill Education, New Delhi,2011.

Reference Books:

1. William Stalling, Computer Organization and Architecture- Designing for Performance, 10th Edition, Pearson Education, 2016.
2. A.S. Tananbaum, Structured Computer Organization, 6th Edition, Pearson Education,2013

PAPER : SH 11 : MATHEMATICAL FOUNDATIONS
Fullmarks: 75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives
This course enables the students:

1.	Attain problem solving attitude in systematic and timely manner.
2.	Apply knowledge of mathematics, algorithm and computing principles appropriately to solve real-world problems.
3.	Identify modern tools and techniques through critical thinking for solving complex problems.

Course Outcomes
After the completion of this course, students are expected to

A.	Gain intense foundational introduction to fundamental concepts in discrete mathematics.
B.	Interpret, identify, and apply the language associated with logical structure, sets, relations and functions.
C.	Applying mathematical approach in real life problem through combinatorics.
D.	Understand Graph Terminologies and their representation, Connected & Disconnected graphs.
E.	Special cases of graph theory like, trees to search the minimal spanning trees.

Module 01(Lecture 08)
Mathematical logic: Propositions, Connectives, Conditional, Tautologies, Normal form, Mathematical Induction (M.I.), Predicate Calculus.

Module 02(Lecture 04)
Sets Concepts: Definition and notations of sets, Types of sets, Set operations & properties, Venn diagram, De-Morgan's laws

Module 03(Lecture 08)
Relation & Function: product sets, partition, binary relation in a set, domain & range, Boolean matrices, Adjacency matrix of a relation, Properties of relation, Equivalence relation, Sum & product of function, types of functions, Compositions of function, Inverse of functions.

Module 04(Lecture 08)
Combinatorics: Basic counting Principles, Factorial notation, Permutation & combination, Pigeonhole principle, Binomial theorem.

Module 05(Lecture 10)
Graph Theory: Introduction, Graph basics, Digraph, Sub graph, Circuit & cycle, Multiple path, Connected Graph, Eulerian graph, Hamiltonian graph, Biconnected graph, Konigsberg Bridge problem, Four colour problem.

Module 06(Lecture 06)
Trees: Definitions, Forest, Rooted Graph, Properties of tree, Binary tree, spanning tree Minimal spanning trees- Kruskal's Algorithm, Prim's Algorithm, Directed tree.

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics & Its Applications: With Combinatorics and Graph Theory, Tata McGraw Hill Education Private Limited,2010
2. Bernard Kolman Robert Busby Sharon C. Ross, Discrete Mathematical Structures, Pearson Education,2018.

Reference Books**:**

1. S. K. Yadav, Discrete Mathematics with Graph theory, Ane Books Pvt. Ltd,2016.
2. Swapan Kumar Chakraborty; Bikash Kanti Sarkar, Discrete Mathematics, Oxford University Press, 2011.

PAPER : SH 12 : BUSINESS COMMUNICATION

Fullmarks: 75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from each module.

Course Objectives

This course enables the students:

1.	Make business communication strategies effectively
2.	Utilize problem solving skills
3.	Develop collaborative work skills with regard to team work
4.	Be in tune with organizational formats and channels
5.	Communicate through mail, internet and other technological medium.

Course Outcomes

After the completion of this course, students are expected to

A.	Analyse the matter and demonstrate it at required platform.
B.	Comprehend the issue and select appropriate medium of presentation
C.	Become able to appropriately apply the mode of expression.
D.	Make effective participation in professional affairs
E.	Develop the ability to give written or oral presentation

Module 01(Lecture 10)

Communication: Verbal Communication, Its Importance and Objectives, Process of Communication, Barriers of Communications, Flow of Communication; Non-verbal Communication: Body language, Gestures, Facial expression,

Module 02(Lecture 04)

Essay writing: Essays on general, social, political, sports, entertainment and other topics

Module 03(Lecture 04)

Précis writing: Precis writing of given extract from newspapers, stories, essays and other kind of writings.

Module 04(Lecture 08)

Slide preparation, presentation principles, written presentation of technical material

Module 05(Lecture 08)
Preparation of bio-data, Covering letter, preparation of bibliography, official correspondence.

Module 06(Lecture 08)
Writing Skills in Business and Public Administration: Business letter, report, Memo, Circulars. Inquiries, Order, Draft and other such writings

Text Books:

1. Raman, M., Sharma, S. “Technical Communication”, Oxford University Press (India),2011.
2. Prasad, P., “Universal English”, S. K. Kataria& Sons (New Delhi),2019.

Reference Books:

1. Ludlow, R., and Panton, F. “The Essence of Effective Communication”, Prentice Hall of India Pvt. Ltd.1992.
2. Munter, M. " Business Communication: Strategy and Skill " Prentice Hall of India Pvt. Ltd.1987.

LABORATORY SYLLABUS FOR M.C.A. 1ST SEMESTER

PAPER: IT-11P: PROGRAMMING LAB

Full marks: 75(25(INTERNAL)+50(EXTERNAL)), Pass Marks: 30, Time: 3 Hrs. Credits: 3

Sl. No.	Name of Experiment
01.	WAP for factorial of a given number.
02.	WAP to check a number is palindrome or not using function
03.	WAP in C for Factorial of given number using recursion method.
04.	WAP to select an option for addition, subtraction, multiplication and division to call by function for each.
05.	WAP for Divide and Conquer search.
06.	WAP for Selection sort, Quick sort, and Merge sort.
07.	WAP for stack and perform operation like. a. Push Operationand b. PopOperation
08.	WAP for insertion of Nodes at beginning, middle and end in Linked list.
09.	WAP for deletion of Nodes at beginning, middle and end in Linked list.
10.	WAP for Circular and doubly linked lists.
11.	WAP for Depth first Search.
12.	WAP for Breadth First Search.

Tools Required: Compiler Turbo C++/GCC

IDE : Turbo C++ IDE, DEV C++ IDE

Operating System Required: Windows 7/10

PAPER: IT-12P:DATABASE LAB

Full marks: 75(25(INTERNAL)+50(EXTERNAL)), Pass Marks: 30, Time: 3 Hrs. Credits: 3

Sl. No.	Name of Experiment
01.	SQL query using DML and DDL commands
02.	SQL query using DCL and TCL commands
03.	Use of Character Functions and Number Functions
04.	Use of Date Function and General Function
05.	Use of group function
06.	Creation of primary key & all constraints in new table
07.	Addition of primary key & all constraints in existing table
08.	Creation of Sequences.
09.	Creation of Views.
10.	Creation of Indexes.
11.	Writing Function in PL/SQL.
12.	Writing Procedure in PL/SQL.
13.	Creation of triggers in PL/SQL.
14.	Creation of Cursor in PL/SQL.
15.	Creation of Packages in PL/SQL.

Tools Required: Oraclce10g

Operating System Required: Windows 7/10

PAPER: IT-13P: PYTHON PROGRAMMING LAB

Full marks: 75(25(INTERNAL)+50(EXTERNAL)), Pass Marks: 30, Time: 3 Hrs. Credits: 3

Sl. No.	Name of Experiment
01.	Write a program to demonstrate basic data type in python.
02.	Write a Program for checking whether the given number is an even number or not.
03.	Write a Program to demonstrate list and tuple in python. Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
04.	Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
05.	Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure.
06.	Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure.
07.	To finding mean, median, mode for the given set of numbers in a list.
08.	Write a Python script for multiplication of two matrices.
09.	Create a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.
10.	Write Python program to implement constructors
11.	Write Python program to implement inheritance
12.	Write Python program to implement Polymorphism.
13.	Write Python program to create a simple calculator, where the user will enter a number in a text field, and either add it to or subtract it from a running total, which we will display. We will also allow the user to reset the total.

Tools Required: Python 3.9, Anaconda,

IDE: Jupyter Note Book/Spider IDE/PyCharm Operating System Required: Windows 7/10