

## SEMESTER II

MCA801C (Core)	Data Structures	3+1+0=4
<b>UNIT I: Introduction [10 Lectures]</b>		
Data Definition, Data Object, Data Types, Built-in Data Type, Derived Data Type, Data Structure and Implementation, Abstract data types.		
<b>Array</b> :as Data Structure, insertion and deletion in an array, Storage Representation of Arrays, Applications of Arrays, Polynomial Representation Using Arrays, insertion and deletion operations in an array.		
<b>Linked List</b> : Singly, circular, doubly, doubly & circular.		
<b>Stack</b> : Representation using array & linked list; operations - push, pop, Applications of stack: recursion. Conversion from infix: to postfix, evaluation of postfix expression.		
<b>Queue</b> : Representation using array & linked list; operation - insert, delete; circular queue, deque, priority queue implementation, Applications of Queue.		
<b>UNIT II: Trees [10 Lectures]</b>		
Terminologies, traversal algorithms (preorder, postorder, inorder). Implementation of binary search tree, threaded tree (one way & two way), AVL tree balancing, Heap tree, <i>B tree</i> - introduction, operation - insertion, deletion, Introduction to red black tree		
<b>UNIT III: Graph [8 Lectures]</b>		
Introduction, Graph Representation, Adjacency Matrix, Adjacency List, Graph Traversals, Depth First Search, Breadth First Search, Spanning trees.		
<b>UNIT IV: Searching and Sorting [10 Lectures]</b>		
Linear search, Binary search, Insertion sort, selection sort, Bubble sort, Merge sort, Heap sort, Quick sort, Radix sort, Complexity analysis of sorting and searching algorithms.		
<b>UNIT V: Hashing [10 Lectures]</b>		
<b>Hashing</b> - definition; Hashing method, Hashing functions:-mid square, folding, remainder, collision resolution & linear probing.		
<b>Textbooks:</b>		
1.S. Liptsuz: Data Structure		
<b>Recommended Books:</b>		
1.M.T. Goodrich, R. Tamassia and D. Mount: Data Structures and Algorithms in C++, John Wiley & Sons, Inc.		
2.Aho, Hopcroft and Ullman:Data Structures and Algorithms, Addison Wesley Publishing Co.		
MCA802C (Core)	Object Oriented Programming using C++	3+1+0=4
<b>UNIT I: Introduction to object oriented programming [4 Lectures]</b>		
Concepts, Need for OOP, Characteristics of OOP: Data hiding, Data encapsulation, Class, Objects, Inheritance, Polymorphism. Advantage of OOPs over other programming methodologies.		
<b>UNIT II: C++ Programming basics [6 Lectures]</b>		
Getting started with C++ syntax, operators, flow control, simple functions, recursion, library functions, Arrays, pointers, structures, namespace scope, string, iostreams .		
<b>UNIT III: Abstraction mechanisms and Pointers [10 Lectures]</b>		
Classes and Objects, data members and member functions, private, public construction, visibility modes, member function definition inside and outside class, Inline functions, Friend functions.		

Arrays within a class, Static members, scope of class and its members. Constructors and Destructors, Constructor overloading, Copy constructors, default constructor.

Inheritance: Base and derived classes, Types of inheritance, ambiguity, virtual base classes, constructors in derived classes.

Polymorphism: Operator overloading, assignment operator, function overriding, Virtual functions.

#### **UNIT IV: Template and Exception handling [10 Lectures]**

Templates: string template, instantiation, template parameters, type-checking, function templates, template argument deduction, specifying template arguments, function template overloading, default template arguments, specialization, conversions.

Exception handling: Error handling, grouping of exceptions, catching exceptions, catch all, re-throw, resource management, auto ptr, exceptions and new, resource exhaustion, exceptions in constructors, exceptions in destructors, uncaught exception, standard exceptions.

#### **UNIT V: Pointers and Files [8 Lectures]**

Memory management: new, delete, Pointers to objects, this pointer.

Files and streams: Stream class, I/O operators, File pointers and their manipulation, Sequential files, random access files.

#### **UNIT VI: Object Oriented Design [10 Lectures]**

Over view of object oriented designing (concepts), steps involved in object oriented designing, advantages of OOD, what is modeling, why modeling is required, UML, different views captured by UML diagrams, Use Case diagram (actors, generalization, association, include dependency, extend dependency etc.), organization of use cases, Use Case Packaging, constraints in use case models, how to find out actors, use cases and use case relationships, Class diagrams, representations, association and links, aggregation, composition, dependency, constraints, interaction diagrams.

#### **Textbooks:**

1.E. Balagurusamy: Object Oriented Programming with C++

#### **Recommended Books:**

1.Olshevsky: Revolutionary Guide to Object Oriented Programming Using C++, SPD/WROX

2.Samanta: Object-Oriented Programming With C++ & JAVA, PHI

3.Wu: Object Oriented Programming with JAVA, TMH

4. Doke: Object Oriented Application Development using JAVA

5.Grady Booch: OBJECT Oriented Analysis and Design, Pearson Education.

<b>MCA803C (Core)</b>	<b>System Programming</b>	<b>3+1+0=4</b>
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#### **UNIT I: The general overview [12 Lectures]**

Definition of operating system, working strategy; Definition and classification of system software; case study of translator program – assembler, interpreter and compiler; case study of UNIX/Linux operating system – kernel, shell and application program, internal representation of files, I-node, file attributes, system calls.

#### **UNIT II: Linux Utilities [12 Lectures]**

Debugger: Types, features, case study of sdb/dbx and an IDE debugger.

Editors: Type, structure, case study of vi and sed.

Study of commands like ls, cat, cut, touch, pwd, head, tail, sort, cmp, split, uniq, comm, wc, cp,rm, rmdir, mkdir, mv,grep, awk, tr, tee, chown, chgrp, join , nl etc

#### **UNIT III: Assembly Language Programming [12 Lectures]**

Structure and syntax of Assembly language, Data format, instruction formats, addressing techniques, Interrupts and program development in 8085.

**UNIT IV: Shell Programming [12 Lectures]**

Features, environmental variables, options, command history, command execution process, basic script concepts, expressions, decision making, selections, conditional and looping statements, case statements, parameter passing and arguments, repetition, special parameters and variables, changing positional parameters, argument validation, debugging scripts.

**Textbooks:**

1. D M Dhamdhare : Systems Programming and Operating Systems, TMG

**Recommended Books:**

1.S. Chattopadhyay: System Software, PHI

2.A. Forouzan and R. F. Gilberg: Unix and shell Programming Behrouz, Ceneage Learning India Pvt Ltd

3.R. Thomas and J. Yates: A User Guide to The UNIX System, Osborne McGraw-Hill

<b>MCA804C (Core)</b>	<b>Computer Organization and Architecture</b>	<b>3+1+0=4</b>
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**UNIT I: Introduction to Digital Computer [6 Lectures]**

Functions and Block Diagram of a Computer, Types of Software – System software, Application software , Utility Software.

Compilers, Interpreters, Assemblers, Linker, Loader & Programming Language Paradigm.

**UNIT II: Data Representation and Boolean Algebra [8 Lectures]**

Binary, Octal, HEX and their inter-conversion,1's and 2's complement, Binary Arithmetic, Number Systems – BCD, EBCDIC, ASCII, De-Morgan's Theorem, Duality Theorem, Algebra Rules, Laws, Logic Circuits, NOT, AND, OR, NAND, NOR, XOR, XNOR.

**UNIT III: Combinational Circuits [8 Lectures]**

Half Adder, Full Adder, Binary Adder and Subtractor, Decoder, Encoder,Multiplexer, Demultiplexer, Sequential Circuits, Flip Flops - SR, D, JK, Master – Slave, Introduction to Counters: Synchronous as well as Asynchronous Counter.

**UNIT IV: Memory System [8 Lectures]**

Memory Hierarchy,Primary Memory – DRAM, SDRAM, DDR, RDRAM. ROM, PROM, EPROM, EEPROM , Concepts of Auxiliary, Associative, Cache and Virtual Memory, DMA.

**UNIT V: CPU Organization [10 Lectures]**

CPU Building Blocks, CPU Registers and BUS Characteristics, Registers & System Bus.

Characteristics, Interface Basics (Only Block Diagram) , Local Bus features & Types should be covered, Addressing Modes.

Interrupts: Concepts and types Instruction and Execution Interrupt cycle, Hardwired and Micro Program control ,RISC and CISC ,Pipelining – Data Path, Time Space Diagram, Hazards. Instruction Set, Arithmetic Pipelining, RISC Pipelining.

**UNIT VI: Multi-Processor Organization [8 Lectures]**

Parallel Processing, Concept and Block Diagram Types (SISD, SIMD, MIMD, MISD), Future Directions for Parallel Processors,Performance of Processors.

**Textbooks:**

1.Morris Mano ,Computer System Architecture

**Recommended Books:**

1. Carpinel, Computer Organization & Architecture

2. Kaithwang , Ad. Computer Architecture

3. Malvino , Digital Computer Electronics
4. Yu Cheng Liu & Glann Gibson , Micro Computer Systems
5. Bartee , Digital Electronics

<b>MCA805L (Lab Course)</b>	<b>LAB-II</b>	<b>0+1+2=3</b>
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### **Laboratory work related with MCA C05- Data Structure**

1. Search an element in a two dimensional array
2. Using iteration and recursion concepts write programs for finding the element in the array using the Binary search method.
3. Perform following operations on tables using functions only - Addition, Subtraction, Multiplication, Transpose.
4. Use iteration and recursion concepts for quick sort.
5. Implement various operations on strings.
6. Swap two numbers using call by value and call by reference strategies.
7. Implement Linked List, Circular and Doubly Linked Lists and perform operations such as insert, delete, update and reverse.
8. Implement Stacks and Stack application, Queues
9. Write a program to simulate various sorting and searching algorithms: Linear Search, Binary Search and Hashing. Selection Sort, Insertion Sort, Bubble Sort, Merge Sort, Heap Sort, Quick Sort, Radix Sort, and Merge-Sort.

*The course instructor may assign additional questions if s/he feels necessary.*

### **Laboratory work related with MCA C06 – Object Oriented Programming using C++**

1. Program on concept of classes and objects.
2. Programs on use of memory management.
3. Programs using polymorphism – i) Function overloading ii) Dynamic binding
4. Programs on use of operator overloading.
5. Programs on exception handling and use of templates.
6. Programs on file handling in C++.
7. Design problem on stock and accounting of a small organization, railway reservation, payroll preparation and optimization problem.

*The course instructor may assign additional questions if s/he feels necessary.*

### **Laboratory work related with MCA C07 – System programming**

1. Course instructor will assign a list of at least 20 commands based on unit II.
2. Course instructor will assign a list of at least 20 shell programs based on unit IV.
3. Course instructor will assign a list of at least 10 Assembly language programming based on unit-III.

*The course instructor may assign additional questions if s/he feels necessary.*

**UNIT I: Introduction [4 Lectures]**

History, salient features, Unix system architecture, Unix command format, Unix internal and external commands, Directory commands, File related commands, Disk related commands, general utilities.

**UNIT II: Secondary Storage Management [4 Lectures]**

Formatting, making file system, checking disk space, mountable file system, disk partitioning, file compression.

**UNIT III: Shell Programming [4 Lectures]**

Vi editor, shell types, shell command line processing, shell script features, executing a shell script, system and user-defined variables, expr command, shell screen interface, read and echo statement.

**UNIT IV: Conditional Control Structures [4 Lectures]**

if statement, case statement, Looping Control ,Structure, while, until, for statements.

**Textbooks:**

1. M.G.Venkateshmurthy, “Introduction to UNIX & SHELL Programming”, First Edition, Pearson Education, 2004.

**Recommended Books:**

1. Forouzan, “Unix and Shell Programming”, 1st Edition, 2008 Cengage Learning India
2. UNIX and Shell Programming, Archana Verma, Firewall Media.

**Lab component:**

At least 10 (Ten) Programs covering the **UNIT IV** concepts