



AHMEDABAD UNIVERSITY

School of Information and Communication Technology

AES INSTITUTE OF COMPUTER STUDIES

Master of Computer Applications (M.C.A.)

First Year MCA :

Trimester II

Subject Code: MCA 121

Subject: Data Structures

Lectures per week (hours) : 3 Lectures + 1 Tutorial

Practicals per week (hours) : 4

Internal Assessment : 50 Marks

External Assessment : 50 Marks

Total Credits : 6

Prerequisite: Introduction to Programming using C

Aim:

The course is aimed to introduce the various types of data structures.

Objectives:

- (1) To understand the concept of data structures and its applications.
- (2) To write program more efficiently.
- (3) To make students familiar with analysis of algorithms.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Introduction to data structure Primitive & Non-primitive data structures, Operations on primitive data structure, algorithm analysis for time and space requirements. Storage management.(array representation, pointer overview)	6	10
Unit II	Stack and Queue <ul style="list-style-type: none">• Definition of stack, Application of stack,• Representation of stack using array and pointer.• Operations on stack• Definition of queue, Application of queue• Representation of queue using array and pointer.• Operations on Queue• Types of Queue	12	14



Unit III	Linked list.	9	12
	Singly linked list.		
	<ul style="list-style-type: none">• Representation of single linked list.• Operations on singly linked list.<ul style="list-style-type: none">○ Insertion as a first node, insertion as a last node, Insertion of a node at specific location.○ Deletion of first node, deletion of last node, deletion of a desired node○ Searching for the particular element○ Sorting the linked list○ Reversing the list○ Traversing a linked list.		
	Doubly linked list		
	<ul style="list-style-type: none">• Representation of doubly linked list.• Operations of doubly linked list<ul style="list-style-type: none">○ Insertion as a first node, insertion as a last node, Insertion of a node at specific location.○ Deletion of first node, deletion of last node, deletion of a desired node○ Searching for the particular element○ Sorting the linked list○ Traversing a linked list.		
	Circular linked list		
	<ul style="list-style-type: none">• Representation of circular linked list• Inserting and deleting a node in it.		
Unit IV	Non-linear data structures	9	14
	Trees		
	<ul style="list-style-type: none">• Definition of tree• Representation of tree• Types of tree• Binary tree traversal• Storage representation and manipulation of binary tree• Conversion of general tree to a binary tree• Other representation of tree, application to tree.		



Graphs

- Representation of graphs
- Graph traversal and spanning forest.
- Finding the shortest path (Warshall's Algorithm, Warshall's modified algorithm, Dijkstra's Technique)
- Graph traversal (depth first search, breadth first search)

Total

36

50

Outcomes:

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

1. Choose appropriate data structures to solve problems.
2. Write programs efficiently using various data structures.

Reference Books:

- (1) An introduction to data structures with applications to computer science, Trembley and Sorenson, TMH (2nd Edition).
- (2) Data structures using C and C++, Y . Langsam, M. J. Augenstein, A. M. Tenenbaum, PHI (2nd Edition).

Additional Reference Books:

- (1) Data Structures through C, Y. P. Kanetkar, BPB Publications (2nd Edition).
- (2) Data Structures and Algorithms: Concepts, Techniques and Applications, GAV Pai, Tata Mc-Graw Hill (1st Edition).



Subject Code: MCA 121 Subject Name: Data Structures
Practicals per week (hours) : 4
Total Marks (Practical Exam) : 50

Topics to be covered in Practical Sessions

Sr. No.	Topics to be Covered	No. of Practicals
1.0	Introduction to data structure 1.1. Array 1.2. Pointers	4
2.0	2.1 Stack 2.1.1. Representation of stack using array 2.1.2. Representation using pointer 2.1.3. Application of stack 2.2 Queue 2.2.1. Representation of queue using array 2.2.2. Representation using pointer 2.2.3. Application of queue 2.2.4. Circular queue 2.2.5. Dqueue 2.2.6. Priority queue	10
3.0	Linked list. 3.1 Singly linked list. 3.1.1 Representation of single linked list 3.1.2 Operations on singly linked list. <ul style="list-style-type: none">• Insertion as a first node, insertion as a last node, Insertion of a node at specific location.• Deletion of first node, deletion of last node, deletion of a desired node• Searching for the particular element• Sorting the linked list• Reversing the list• Traversing a linked list.• Splitting list• Merging list 3.2 Doubly linked list 3.2.1 Representation of doubly linked list.	10



3.2.1 Operations of doubly linked list

- Insertion as a first node, insertion as a last node, Insertion of a node at specific location.
- Deletion of first node, deletion of last node, deletion of a desired node
- Searching for the particular element
- Sorting the linked list
- Traversing a linked list.

3.3 Circular linked list

- ##### 3.2.1 Representation of circular linked list
- Inserting and deleting a node in it.

4.0 **Non-linear data structures** 12

Trees

- Implementation of tree using linked list and array
- Binary tree traversal
- Storage representation and manipulation of binary tree
- Conversion of general tree to a binary tree
- Other representation of tree
- Application of tree.

Graphs

- Representation of graphs
- Graph traversal and spanning forest.
- Finding the shortest path (Warshall's Algorithm, Warshall's modified algorithm, Dijkstra's Technique)
- Graph traversal (depth first search, breadth first search)

Total

36



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AES INSTITUTE OF COMPUTER STUDIES

Master of Computer Applications (M.C.A.)

First Year MCA :

Trimester II

Subject Code: MCA 122

Subject Name: Database Management System-II

Lectures per week (hours) : 3 Lectures + 1 Tutorial

Practical per week (hours) : 3

Internal Assessment : 50 Marks

External Assessment : 50 Marks

Total Credits : 7

Prerequisite: Basic Knowledge of Database Management System & SQL.

Aim:

The course is aimed to give advanced knowledge of Database Management Systems related to online transaction, back up, recovery and security of database.

Objectives:

- (1) To understand the concept and architecture of ORACLE.
- (2) To make students familiar with Transaction Processing and Concurrency Control.
- (3) To provide basics of PL/SQL

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Database Architecture Oracle Architecture -Introduction, Memory structures of SGA, Background processes, Additional Process and memory structure, Physical structure of database, Logical structure of database. Types of Databases Introduction to other databases(MS-SQL Server, MYSQL),Overview and comparison of Parallel, Distributed and Object oriented Database along with pros. and cons.	8	12
Unit II	Transaction Processing and Concurrency Control Transaction concepts: execution and problems, transaction execution with SQL, transaction properties, transaction log. Concurrency control: problems, schedules, degree of consistency, permutable actions, serializable schedule, locking methods for concurrency control, timestamp ordering.	10	12



Unit III	Database Administration Need of backup, techniques of back up, types of database failure, types of database recovery, recovery techniques, threat to database security, statistical database security, granting of privileges using SQL, audit trail, firewall, data encryption.	8	10
Unit IV	PL/SQL Advantage of PL/SQL over SQL, features of PL/SQL, Architecture of PL/SQL, programming environment of PL/SQL, Cursor: implicit – explicit – Ref(strong ,weak) , record types, stored procedure, function, package, trigger, exception handling.	10	16
	Total	36	50

Outcomes:

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

1. Apply concepts of online transaction processing for any Business Application.
2. Take Backup of database and restore in case of database failure.
3. Apply concepts of PL/SQL programming as Application Programmer.

Reference Books:

- (1) Database Systems- Concepts, Design and Applications, S K Singh, Pearson Education, 1st Edition.
- (2) Oracle 9i DBA Handbook, Loney, TMH, 1st Edition
- (3) Oracle 9i PL/SQL Programming, Scott Urman, TMH, TMH Edition.

Additional Reference Books:

- (1) Database Management Systems, Ramakrishnan and Gehrke, Mc Graw -Hill, 3rd Edition.
- (2) Database System Concepts, Silberschatz – Korth – Sudarshan, Mc Graw -Hill, 5th Edition
- (3) Fundamentals of Database Systems, Elamsri – Navathe, Pearson Education, 5th Edition
- (4) SQL, PL/SQL, The Programming Language of ORACLE, Ivan Bayross, BPB Publication, 4th Revised Edition.
- (4) Database Administrator II Backup/Recovery and Network Administration, Claire Rajan, Cenage Learning, India Edition.



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Master of Computer Applications (M.C.A.)

Subject Code: MCA 122 **Subject Name:** Database Management System - II
Practical per week (hours) : 4
Total Marks (Practical Exam) : 50

Topics to be covered in Practical Sessions

Sr. No.	Topics to be Covered	No. of Practicals
1.0	PL/SQL - I	05
	1.1 PL/SQL Block Basics	
	1.2 PL/SQL Data Types	
	1.3 Programming Environment of PL/SQL	
	1.4 Implicit Cursor	
	1.5 Explicit Cursor	
	1.6 Cursor loops	
2.0	PL/SQL – II	05
	2.1 Ref Cursor	
	2.2 Strong and Weak Cursor	
	2.3 PL/SQL Records	
	2.4 Exception Handling	
	2.5 Procedures	
3.0	PL/SQL – III	08
	3.1 Functions	
	3.2 Packages	
	3.3 Triggers.	
	Total	18



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School of Information and Communication Technology

AES INSTITUTE OF COMPUTER STUDIES

Master of Computer Applications (M.C.A.)

First Year MCA :

Trimester II

Subject Code: MCA 123

Subject: Programming using C and C++

Lectures per week : 4 Lectures

Internal Assessment : 50 Marks

External Assessment : 100 Marks (50 Marks (Theory) + 50 Marks (Practical))

Total Credit : 8

Prerequisite: Basic knowledge of problem solving and C language.

Aim:

The course is aimed to understand the advance concepts of procedural programming language and create a base for object oriented concepts.

Objectives:

- (1) To understand the mechanism of classes and structures.
- (2) To introduce the concept of efficient storage management techniques.
- (3) To give knowledge of file management in C and C++.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Introduction to C++ Software evolution of programming languages, Difference between procedural programming approach and object-oriented programming approach, features and advantages of OOP approach, object oriented concepts (objects, classes, data abstraction and encapsulation, inheritance, polymorphism, dynamic binding, message passing), comparison C and C++, applications of C++, Structure of a C++ program, data types, reference variables, operators in C++, type-conversions (explicit and implicit), water-fall model of type conversion,	9	10



Unit II	Structures, Classes and functions Introduction, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization, Copying and comparing structure variables, Operations on individual members, Arrays of structures, Arrays within structures, Structures within structures, Structures and functions, Unions, Size of structures, Bit fields difference between structure in C and C++ class, creating objects from C++ classes, C++ functions, function prototyping, inline functions, function overloading, Call by reference	9	13
Unit III	Pointers Introduction, Understanding pointers, Accessing the address of a variable, Declaring and Initialization of pointer variables, Accessing a variable through its pointer, Chain of pointers, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Arrays of pointers, Pointers as function arguments, Functions returning pointers, Pointers to functions, Pointers and structures Dynamic memory allocation Introduction, Dynamic memory allocation, Allocating a block of memory : MALLOC, Allocating multiple blocks of memory : CALLOC, Releasing the used space : Free, altering the size of block: REALLOC	9	12
Unit IV	File IO in C Introduction, Defining and opening a file, Closing a file, Input/output operations on files, Error handling during I/O operations, Random access to files, Command line arguments Streams and File IO in C++ Concept of streams, input and output streams, console IO functions, formatting functions using flags, Reading and writing data to files using file streams. Introduction to Preprocessor Introduction, Macro substitution, File inclusion	9	15
	Total	36	50



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Outcomes:

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

1. Use Class and Structure to store data having different data types
2. Manage memory space efficiently.
3. Read and write simple disk files.
4. Access data randomly using files.

Reference Books:

1. The Complete Reference C - Herbert Schildt -4th Edition- McGraw Hill Companies, New Delhi.
2. The Complete Reference C++ - Herbert Schildt -4th Edition- McGraw Hill Companies, New Delhi.

Additional Reference Books:

1. Programming in ANSI C - E Balagurusamy , 4th Edition - McGraw-Hill Companies, New Delhi.
2. Let us C - Kanetkar Y., 9th Edition, BPB Pub., New Delhi.
3. The C Programming language ANSI C version , Brian W. Kernighan and Dennis Ritchie, 2nd Edition, Prentice Hall
4. Programming with ANSI C++ by Bhushan Trivedi, Oxford University Press (1st Edition)
5. Object oriented Programming in Turbo C++ by Robert Lafore (1st Edition, 2002)
6. Let Us C ++ by Yashwant Kanitkar



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Master of Computer Applications (M.C.A.)

Subject Code: MCA 123

Subject Name: Programming using C and C++

Practicals per week (hours) : 4

Total Marks (Practical Exam) : 50

Sr. No.	Topics to be Covered	No. of Practical
1	Functions, Classes and Objects Data types, C++ functions, function prototyping, inline functions, function overloading, Call by reference, difference between structure and class, creating objects from class, static-members of class.	9
2	Structures Implementation of structure, Arrays of structures, Arrays within structures, Nested structures Introduction to Pointers Declaration, Initialization, Indirection operator, address of operator, Accessing address of a variable Pointer arithmetic.	9
3	Advanced Pointers Arrays and pointers, Pointers and Character Strings Function and pointers, Pointer and Structures File management in C Defining and opening a file, Closing a file, Input/output operations on files, Error handling during I/O operations, Random access to files, Command line arguments.	9
4	File management in C++ Concept of streams, input and output streams, console IO functions, formatting functions using flags, Reading and writing data to files using file streams The Preprocessor Simple Macro substitution	9
	Total	36



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Master of Computer Applications (M.C.A.)

First Year MCA :

Trimester II

Subject Code: MCA 124

Subject: Discrete Mathematics For Computer Science

Lectures per week (hours) : 3 Lectures + 1 Tutorial

Practicals per week (hours) : -

Internal Assessment : 50 Marks

External Assessment : 50 Marks

Total Credits : 4

Prerequisite: The basic knowledge of set theory and functions are required.

Aim:

The course is aimed to understand the mathematics behind many concepts of computer applications like RDBMS, Logical design of gates, Data Structures, Analysis of algorithm etc.

Objectives:

- (1) To understand the concept of relation and will apply it in RDBMS.
- (2) To acquire knowledge of Boolean algebra and apply it in construction of various types of logical gates and minimization of circuits. This way they can gain knowledge of “how to save hardware” using the concept of Boolean algebra.
- (3) To enhance skills of developing logic.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Lattices Definition, Types and Properties of relation – Matrix of a relation – Equivalence relation – Partition and covering of a set – Composition of relation – Equivalence class – Computer application of relation Examples of Posets – Hasse diagram – Maximal, Minimal, least and greatest elements of a poset – Computer application of poset or partial ordering Definition of lattice – Properties of lattices – Lattice as an algebraic system – Sub lattice – Direct product and homomorphism – Special lattices like bounded lattice, distributive lattice, complemented lattice, and complete lattice.	10	15



Unit II	Boolean Algebra and Applications of Boolean Algebra	10	15
	Definition of Boolean algebra – Sub algebra – Direct product and homomorphism – Join and meet irreducible – atoms, anti atoms - stone’s representation theorem (only statement)		
	Boolean expressions – Free Boolean algebra – Min & Max terms – Values of Boolean expressions – Boolean functions – Representation of Boolean function		
	Minimization of Boolean functions using k – map and Quine - McCluskey algorithm		
Unit III	Group Theory	08	12
	Definition and examples of group – Properties of group – Abelian group – Permutation group (Symmetry of triangles) – Subgroup – Group homomorphism – Cyclic group – Cosets and Lagrange theorem(only statement) – Normal subgroup		
Unit IV	Recurrence Relation and Predicate Calculus	08	08
	Recurrence Relation: Concept of recurrence relation – Classification of recurrence relation – Examples of recurrence relation.		
	Predicate Calculus: Introduction – Predicates – The statement functions - variables and quantifiers – Predicate formulas – Free and bound variables – Universe of discourse – Predicate Calculus		
	Total	36	50

- No proof is required for theorems or results. Theorems should be justified or explained by giving suitable examples

Outcomes:

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

1. Apply the concept of relation in RDBMS very effectively.
2. Find minimal Boolean expressions using various algorithms of Boolean algebra.
3. Learn the fundamentals of logic.



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Reference Books:

- (1) Discrete Mathematical Structures with Applications to Computer Science by J. P. Tremblay and R. Manohar, Tata McGraw – Hill, 1st Edition
- (2) Discrete Mathematical Structures for Computer Scientists and Engineers by M. K. Das, Narosa Publication, 1st Edition
- (3) Discrete Mathematics by Vinay Kumar, BPB Publication, 1st Edition

Additional Reference Books:

- (1) Discrete Mathematics and its Applications by K.H. Rosen, Tata McGraw Hill, 6th Edition
- (2) Discrete Mathematical Structures – Theory and Applications by D.S. Malik and M.K. Sen, Thomson Publication, 1st Edition.
- (3) Discrete Mathematical Structures by Bernard Kolman, Robert C. Busby, Pearson Education Ltd., 5th Edition
- (4) Discrete Mathematics with Graph theory and Combinatorics by T. Veerarajan, Tata McGraw Hill, 1st Edition



First Year MCA :

Trimester II

Subject Code: MCA 125

Subject: Communication Skills

Lectures per week (hours) : 3 Lectures + 1 Tutorial

Practicals per week (hours) : Nil

Internal Assessment : 50 Marks

External Assessment : 50 Marks

Total Credits : 4

Prerequisite: None

Aim:

The course is aimed to develop all round communication skills of the students- listening, speaking and writing.

Objectives:

- (1) To understand the concept, process and importance of communication.
- (2) To gain knowledge of media of communication.
- (3) To develop skills of effective communication - both written and oral.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Introduction to Communication and Oral and non verbal Communication Nature and scope of communication – Barriers to communication – Listening – Presentations – Non-verbal communication – Interviews – Group Discussions – Meetings and Conferences – Conversations – Negotiations – Informal Oral Communication - Speaking	9	12
Unit II	Written Communication and Business Letter Writing Writing Process – Words and Phrases – Sentences – Paragraphs – Letter Writing – Planning a letter – Types of Letters Sales, Job Application, Claim and Adjustment, Credit and collection - Memos	9	13



Unit III	Report Writing and Resume Preparation	9	13
	Report Writing – Short Reports – Long Reports – Elements of style in report Writing - Resume Preparation		
Unit IV	Other Miscellaneous Documents and Topics	9	12
	How to write e mails, Proposals, Quotations, Research Papers and Dissertations, Thesis, Instruction Manuals, Notices, Agenda , Minutes, Orders, Tenders – Communication across Functional areas – Cross cultural communication - Ethics in Business Communication – Social Correspondence		
	Total	36	50

Outcomes:

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

1. Effectively communicate orally in formal, informal and social situations.
2. Effectively engage in all types of written communication.

Reference Books:

- (1) Technical Communication, Oxford University Press, Meenakshi Raman and Sangeeta Sharma, 1st Edition.
- (2) Business Communication, Oxford University Press, Meenakshi Raman and Prakash Singh, 1st Edition.
- (3) Business Correspondence and Report Writing, Oxford University Press, R C Sharma and Krishna Mohan , 3rd Edition.
- (4) Basic Business Communications, TMH R Lesikar and M Flatley, 9th Edition.
- (5) Communication Skills for Engineers, Pearson Education, Sunita Mishra and C Muralikrishna, 1st Edition

Additional Reference Books:

- (1) Essentials of Business Communication, Sultan Chand & Sons, Rajendra Pal and J. S. Korhalli, 1st Edition.
- (2) Business Communication (Principles, Methods and Techniques), Deep & Deep Publications Pvt. Ltd., Nirmal Singh, 2nd Edition.
- (3) Business Communication, Galgotia Publishing Company, K. K. Sinha, 1st Edition



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Don't Quit

*When things go wrong as they sometimes will
When the road you're trudging seems all up hill.
When funds are low and the debts are high.
And you want to smile, but you have to sigh.
When care is pressing you down a bit.
Rest, if you must, but don't you quit.
Life is queer with its twists and turns.
As every one of us sometimes learns.
And many a failure turns about
When he might have won had he stuck it out:*

*Don't give up though the pace seems slow -
You may succeed with another blow.
Success is failure turned inside out -
The silver tint of the clouds of doubt.
And you never can tell how close you are.
It may be near when it seems so far:
So stick to the fight when you're hardest hit
it's when things seem worst that you must not QUIT.*

You cannot solve a problem until you acknowledge that you have one and accept responsibility for solving it.