



AHMEDABAD UNIVERSITY

H. L. INSTITUTE OF COMPUTER APPLICATIONS

Bachelor of Computer Applications (B.C.A.)

Second Year BCA :

Trimester IV

Subject Code: BCA 241 Subject: Data Structures

Lectures per week : 2 Theory + 1 Tutorial

Practical Sessions per Week : 2

Internal Assessment : 50 Marks

External Assessment : 50 Theory + 50 Practical

Total Credit : (2 Theory + 1 Tutorial + 2 Practical): Total - 5

Prerequisite:

Knowledge of Programming language is required, like 'C' language.

Aim:

The course is aimed to select the proper data structure for problem solving strategies as the data structure is used for the storage and retrieval of data in/from computer so that the data can be used efficiently.

Objectives:

To give knowledge of linear data structures like array, stack, queue etc.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Introduction and Overview Definition, Data and information, Concept of data type, and data structures Classification of data structure <ul style="list-style-type: none"> - Primitive - Non-primitive (Linear and Non-linear) Arrays Definition, Terminology One-dimensional array <ul style="list-style-type: none"> - Memory allocation for an array - Operations on arrays - Application of arrays Multidimensional arrays <ul style="list-style-type: none"> - Two-dimensional arrays (Row major and Column major order) - Sparse matrices Three-dimensional	7	12
Unit II	Stacks Introduction, Definition Representation of stack <ul style="list-style-type: none"> - Array representation Operations on stacks Applications of stack <ul style="list-style-type: none"> - Conversion of Infix expression to Postfix and Prefix expression, Evaluation of arithmetic Expressions, Implementation of Recursion : Factorial calculation 	7	12



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Unit III	Queues Introduction, Definition Representation of Queues - Array representation Various Queue structures - Circular Queue, Deque, Priority Queue Application of Queues - Simulation, CPU Scheduling in multiprogramming environment, Round robin algorithm	7	12
Unit IV	Searching and Sorting Sequential Search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort	7	14
	Total	28	50

Outcomes:

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

1. Select appropriate data structure for solving any problem.
2. Understand the real life applications of array, stack and queue.
3. Select appropriate searching and sorting technique based on the problem given.

Reference Books:

- (1) Classic Data Structures - Second Edition - D. Samanta - Prentice Hall of India Private Limited, New Delhi.

Additional Reference Books:

- (1) Data Structure Through C - First Edition – Yashavant P. Kanetkar – BPB Publications, New Delhi.
- (2) Data Structures using C – First Edition – ISRD Group - Tata McGraw-Hill Publishing Company Limited, New Delhi.
- (3) Data Structures and Algorithms - First Edition – G.A.V. Pai - Tata McGraw-Hill Publishing Company Limited, New Delhi.
- (4) C and Data Structures – First Edition – P. Padmanabham – BS Publications.
- (5) Data Structures Using C and C++ - Second Edition – Yedidyah, Augenstein, Tanenbaum - Prentice Hall of India Private Limited, New Delhi.



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Topics to be covered in Practical Sessions

Total Marks: 50

Sr. No.	Topics to be Covered	No. of Practicals
1.0	Arrays	5
	1.1 One-dimensional array	
	1.1.1 Insertion	
	1.1.2 Deletion	
	1.1.3 Searching	
	1.2 Two-dimensional array	
	1.2.1 Add two matrices	
	1.2.2 Multiply two matrices	
2.0	Stacks	9
	2.1 Operations on Stacks using array (Push, Pop, Peep, Change)	
	2.2 Conversion of Infix expression to Postfix expression	
	2.3 Recursion (Factorial Calculation)	
3.0	Queues	9
	3.1 Simple Queue	
	3.2 Circular Queue	
	3.3 Priority Queue	
4.0	Searching and Sorting	13
	4.1 Sequential Search	
	4.2 Binary Search	
	4.3 Bubble Sort	
	4.4 Selection Sort	
	4.5 Insertion Sort	
	4.6 Quick Sort	
	4.7 Merge Sort	
	Total	36



Subject Code: BCA 242	Subject : Scientific Computing
Lectures per week	: 3 Lectures + 1 Tutorial
Practical Sessions per Week	: 2
Internal Assessment	: 50 Marks
External Assessment	: 50 Theory + 50 Practical
Total Credit	: (3 Theory + 1 Tutorial+2 Practical): Total-6

Prerequisite: Knowledge of C language.

Aim:

To focus on the problem of solving system of numerical methods with the aid of computer programs. To solve the system of non linear algebraic equations using iterative method for large sparse system. To develop the ability to find approximate solutions and/or answers to the problems where analytical methods become more complex. To choose correct numerical techniques for a given problem.

Objectives:

- (1) To give students a working knowledge of numerical methods and concepts of computer techniques using the programming language C and MATLAB..
- (2) To train students in fairly wide range of numerical techniques so that they are prepared to apply the knowledge in the field of computer science
- (3) To enable students to understand the uses and limitations of numerical methods with Computer related computational approaches.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Floating point arithmetic and Error in numerical analysis Introduction, basic terminology, computer arithmetic, floating point arithmetic, normalized floating point representation, floating point operations, consequences (pitfalls) of Floating Point Arithmetic, Different Types of Errors In Numerical Computations	6	7
Unit II	Numerical solutions of non linear equations Introduction, Methods of finding solutions of non linear equations, Bisection method, Regula falsi method, Secant method, Newton Raphson method, Successive approximation method.	12	18



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Unit III	Interpolation Introduction ,Finite Differences , Newton's forward difference interpolation formula, Newton's backward difference interpolation Formula, extrapolation and inverse interpolation, Lagrange's interpolation, Lagrange's inverse interpolation, Newton's divided difference Interpolation Formula	12	18
Unit IV	Curve Fitting Introduction, Method of Least squares, fitting of a straight line.	6	7
	Total	36	50

Note: No mathematical derivation of any method is required.

Outcomes:

Upon the completion of this course, the student will be able to:
to tackle different numerical methods and computational techniques for problem solving in research organization as a programmer

Reference Books

- (1) Computer based Numerical and statistical Techniques by Santosh Kumar , S.Chand Publications, Second Edition
- (2) Numerical methods: With programs in C
T Veerarajan and T Ramchandran, Second Edition, Tata Mcgraw-Hill Publishing Company,New Delhi

Additional Reference Books

- (1) Numerical Computational Methods
P.B.Patil , U.P. Verma Revised edition, Narosa Publications, New Delhi
- (2) Applied Numerical methods for Engineering using MATLAB and C
Robert J.Schilling, Sandra L.Harrish,Indian edition, Cengage Learning



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Subject Code: BCA 242

Subject Name: Scientific Computing

Topics to be covered in Practical Sessions

Total Marks: 50

Sr. No.	Topics to be Covered	No. of Practical
1.0	Numerical Error (Using C/C++)	4
	1.1 Arithmetic operations of two floating points numbers	
	1.1.1 Addition	
	1.1.2 Subtraction	
	1.1.3 Multiplication	
	1.1.4 Division	
	1.2 Relative and absolute error because of rounding off and Truncation	
2.0	Iterative methods (Using C/C++)	6
	2.1 Bisection Method	
	2.2 Regula Falsi Method	
	2.3 Secant method	
	2.4 Newton Raphson	
	2.5 Successive Approximation	
3.0	Interpolation (Using C/C++)	8
	3.1 Display Difference tables	
	3.1.1 Forward	
	3.2.2 Backward	
	3.2.3 Divided	
	3.2 Interpolation Formula	
	3.1.1 Forward	
	3.2.2 Backward	
	3.2.3 Divided	
	3.3 Lagrange's Formula	
	3.1.1 Interpolation	
	3.2.2 Inverse interpolation	
4.0	Curve Fitting (Using C/C++)	
	4.1 Method of least square	2
	Total	20

**Subject Code: BCA 243****Subject : Advanced Database Management System**

Lectures per week	: 2 Lectures + 1 Tutorial
Practical Sessions per Week	: 2
Internal Assessment	: 50 Marks
External Assessment	: 50 Theory + 50 Practical
Total Credit	: (2 Theory + 1 Tutorial+ 2 Practical) : Total-5

Prerequisite : Basic concepts of Database Management System**Aim:**

The course is aimed to develop the techniques and skills of database designing which can be applied in real time software development. After learning this subject, students can decide where and how to store and retrieve the information effectively using advanced concepts of Database. Also to acquaint the students to one of the relational database management system namely ORACLE and an open source database management system namely MySQL. To make students familiar with the fourth generation language named structured query language which can be used to solve ad hoc queries.

Objectives:

- (1) To understand the importance of database design.
- (2) To gain knowledge of basic and advanced concepts of relational database such as types of keys, integrity rules, Entity-Relationship modeling and normalization.
- (3) To develop skills of writing queries and basic programs in fourth generation language SQL by using a relational database management system named ORACLE.
- (4) To make students familiar with the advanced database concepts such as transaction and distributed database management system.
- (5) To notify the students about the most recent technology in database i.e. open source technology.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Design Concepts of the Relational Database Model Data vs. information, Introducing the database and the DBMS, Why database design is important, Problems with the file system data management, DBMS functions, Data models : Hierarchical; Network; Relational, Degrees of data abstraction : External; Conceptual; Internal, Relational Database Model : Tables and their characteristics; Keys; Integrity rules; Relational set operators; Data dictionary	7	15



Unit II	E-R modeling and Normalization Entity-Relationship modeling and its examples, The need for normalization, The normalization process: Conversion to First, Second and Third normal forms, Improving the design, Surrogate key considerations; Denormalization.	7	15
Unit III	Advanced Database Concepts and Open Source Technology in Database Transaction management : Transaction properties; Transaction log, Concurrency control problems : lost update; uncommitted data; inconsistent retrieval, Locking methods : Binary lock; Shared/Exclusive locks, The evolution of distributed database management system, Advantages and disadvantages of DDBMS, Open Source Technology : Overview of an open source database MySQL	7	10
Unit IV	Implementation with SQL and PL/SQL Data types, Data definition commands, Data manipulation commands; Types of constraints, Special operators, Joining tables, Views, Date functions, Conversion function, Mathematical functions, Aggregate functions, String functions, PL/SQL block, Cursors, Stored Procedure and Function	7	10
	Total	28	50

Outcomes:

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

1. Use the basic and advanced concepts of the database management system to design and create the database table structures of any real time application by applying concepts of entity-relationship and normalization efficiently.
2. Solve any query by using the fourth generation language SQL and write small programs with Procedural SQL in the DBMS ORACLE.
3. Know the importance of transaction management and concurrency control during simultaneous execution of transactions.
4. Apply concepts of RDBMS with open source database namely MySQL.

Reference Books:

- (1) Database Systems : Design, Implementation and Management, Indian Edition – Peter Rob and Carlos Coronel – Cengage Learning.
- (2) SQL, PL/SQL : The Programming Language of ORACLE, Third Edition – Ivan Bayross – BPB Publications



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Additional Reference Books:

- (1) Fundamentals of Database Systems, Fifth Edition – Ramez Elmasri and Sham Navathe – Pearson Education.
- (2) Introduction to Database Management System, First Edition – Atul Kahate – Pearson Education
- (3) Database Management Systems, First Edition – V.K. Jain – Dreamtech Press
- (4) Database Systems Using Oracle, Second Edition – Nilesh Shah – PHI Pvt. Ltd.
- (5) MySQL Tutorial, First Edition – Luke Welling and Laura Thomson – Pearson Education(Singapore) Pvt. Ltd.

Subject Code: BCA 243 Subject Name: Advanced Database Management System

Topics to be covered in Practical Sessions

Total Marks: 50

Sr. No.	Topics to be Covered	No. of Practicals
1.0	Introduction to SQL	12
	1.1 Data types	
	1.2 Data definition commands	
	1.2.1 Create table	
	1.2.2 Alter table	
	1.2.3 Drop table	
	1.2.4 Truncate table	
	1.2.5 SQL Constraints	
	1.3 Data manipulation commands	
	1.3.1 Adding table rows	
	1.3.2 Listing table rows	
	1.3.3 Deleting table rows	
	1.3.4 Updating table rows	
	1.3.5 Saving table changes	
	1.3.6 Restoring table contents	
	1.3.7 Inserting table rows with Select subquery	
	1.4 Select queries	
	1.4.1 Selecting rows with conditions	
	1.4.2 Use of Arithmetic operators	
	1.4.3 Use of Logical operators	
	1.4.4 Use of Special operators	
	1.5 Advanced data definition commands	
	1.5.1 Changing column's data type characteristics	
	1.5.2 Adding and Dropping a column	
	1.5.3 Copying parts of tables	
	1.5.4 Adding primary and foreign keys	
	1.6 Advanced select queries	
	1.6.1 Ordering a listing	
	1.6.2 Listing unique values	
	1.6.3 Aggregate functions	
	1.6.4 Grouping	



2.0	Advanced SQL	12
2.1	Virtual tables	
2.1.1	Creating a view	
2.1.2	Updatable and non-updatable view	
2.1.3	Read only view	
2.2	Joining database tables	
2.2.1	Joining tables with alias	
2.2.2	Recursive (Self) join	
2.2.3	Cross join	
2.2.4	Natural join	
2.2.5	Inner join	
2.2.6	Outer join	
2.2.7	Multiple join	
2.3	Relational set operators	
2.3.1	Union	
2.3.2	Intersect	
2.3.3	Minus	
2.4	Sub queries	
2.5	SQL functions	
2.5.1	Date and time functions	
2.5.2	String functions	
2.5.3	Numeric functions	
2.5.4	Conversion functions	
3.0	PL/SQL	12
3.1	Creating PL/SQL block	
3.2	Working with Cursors	
3.3	Stored procedure	
3.4	Stored function	
	Total	36

Note : The practicals should be done in ORACLE DBMS.

**Subject Code: BCA 244****Subject: Fundamentals of Operating System**

Lecturer per week : 3 Lectures + 1 Tutorial
Internal Assessment : 50 Marks
External Assessment : 50 Marks
Total Credit : (3 Theory + 1 Tutorial): Total-4

Aim:

Operating System is a core course in computer science curricula and forms a foundation for students to grasp the world between hardware and applications. The motive of teaching this subject is to bring to notice of the students that there are several software layers that isolate a user from hardware. The software layer, nearest to hardware, which facilitates launching all the other software utilities and applications, is called the operating system. This course aims to teach the students the fundamental concepts of the operating system that are applicable to a variety of systems.

Objectives:

- (1) To gain knowledge about the components of the operating system.
- (2) To learn how the components of operating system interact and interrelate.
- (3) To provide information about the functions and goals of each of the components of the operating system.
- (4) To know about Distributed operating system.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Introduction Operating System Software, Types of Operating Systems. Memory Management Single-User Contiguous Scheme, Fixed Partitions, Dynamic Partitions , Allocation and Deallocation methods, Relocatable Dynamic Partitions. Paged Memory Allocation, Demand Paging. Page Replacement Policies and Concepts :First-In, First-Out ,Least Recently Used , Paging , Segmented Memory Allocation ,Segmented/Demand Paged Memory Allocation ,Virtual Memory	9	16
Unit II	Process Management Job Scheduler, Process Scheduler - Job and Process Status; Process Control Blocks. Process Scheduling Policies, Process Scheduling Algorithms: First-Come, First-Served, Shortest Job Next, Priority Scheduling, Shortest Remaining Time, Round Robin.	9	16



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	Process Synchronization		
	What Is Parallel Processing, Process Synchronization Software-Test-and-Set ,WAIT and SIGNAL ,Semaphores .Process Cooperation-Producers and Consumers ,Readers and Writers		
Unit III	Deadlock	9	10
	Deadlock-Conditions for Deadlock ,Strategies for Handling Deadlocks, Starvation		
	Device Management		
	System Devices, Access Time Required, Components of the I/O Subsystem, Communication among Devices, Management of I/O Requests, Device Handler Seek Strategies-FCFS, SSTF, SCAN, LOOK, C-SCAN, C- LOOK		
Unit IV	File Management	9	8
	The File Manager, Interacting with the File Manager, File organization, Physical storage allocation, Data Compression, Access Methods, Access Controls. Introduction to Distributed Operating System		
	Total	36	50

Outcomes:

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

1. Identify the managers of the operating system.
2. Distinguish between the different types of operating system.
3. Specify how each manager communicates with the other managers of the operating system.
4. State the functions of each of the managers of the operating system.
5. Understand the key terms and concepts of the operating system.
6. Appreciate and understand the drawbacks of distributed operating system.

Reference Books :

- (1) Operating Systems-Ida M. Flynn/Ann McIver McHoes- Indian Edition, Cengage Learning.

Additional Reference Books:

- (1) Modern Operating Systems-Andrew S. Tanenbaum-Second Edition-Prentice Hall of India Private Limited, New Delhi,
- (2) Operating Systems-Stuart E Madnick and John J Donovan-McGraw-Hill Education.



Subject Code: BCA 245	Subject: Object-Oriented Programming - I
Lectures per week	: 2 Lectures + 1 Tutorial
Practical Sessions per Week	: 2
Internal Assessment	: 50 Marks
External Assessment	: 50 Theory + 50 Practical
Total Credit	: (2Theory + 1 Tutorial+ 2 Practical): Total-5

Prerequisite:

Knowledge of Procedure Oriented Programming (C)

Aim:

The aim of this course is to make students familiar with object oriented programming concepts.

Objectives:

- (1) To understand the need and importance of Object Oriented Programming.
- (2) To simulate the real world problem using Object Oriented Programming.

Unit No.	Topics to be Covered	No. of Lectures	Marks per Unit
Unit I	Introduction to Object oriented Programming Procedure oriented paradigm - basic features of object oriented programming - comparison of POP with OOP - benefits of OOP - applications of OOP - structure of c++ program - creating source file - compiling and linking - Keywords, Identifiers and Constants - Data types - Variables and reference variables - Operators - control structures – String Functions	7	10
Unit II	Classes objects and functions Introduction to classes - Concept of object and memory allocation - Data members and member functions(static and const) - Access specifiers - function prototyping - call by value - call by reference - function returning by reference - inline functions - default arguments - const arguments - function overloading - friend function - namespaces	7	12
Unit III	Constructors, Destructors and Dynamic memory allocation Introduction to constructors - Types of constructors(Default, Parameterized, Copy and dynamic) - dynamic initialization of objects - Destructor - Dynamic memory allocation and deallocation using new and delete operators - set_new_handler function	7	14



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Unit IV	Operator overloading and Type Conversions	7	14
	Concept of operator overloading - Overloading Unary and Binary operator - overloading “<<” and “>>” operator - type conversions		
	Total	28	50

Outcomes:

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

1. Implement concepts like class, object, overloading in C++.
2. Use available main memory efficiently using dynamic memory allocation concept.
3. Apply above concepts for higher trimester subjects.

Reference Books:

- (1) Object Oriented Programming with C++ - E Balagurusamy –Fourth Edition-Tata McGraw-Hill, New Delhi.
- (2) Object Oriented Programming with C++ - Sourav Sahay – Oxford University Press

Additional Reference Books:

- (1) C++ Programming Language – B. Stroustrup –Third Edition-Addison Wesley Longman

Subject Code: BCA 245

Subject Name: Object oriented programming 1

Topics to be covered in Practical Sessions

Total Marks: 50

Sr. No.	Topics to be Covered	No. of Practicals
1.0	Basic concepts and String Functions	6
	1.1 Simple console I/O programs	
	1.2 Using Variables and constants	
	1.3 Using reference variables	
	1.4 Using Operators	
	1.5 Control structures (if-else, while, for, do-while)	
	1.6 String Functions	



2.0	Classes, objects and functions	
2.1	Examples using class	10
2.2	Access specifiers	
2.3	Function prototyping	
2.3.1	Call by value	
2.3.2	Call by reference	
2.3.3	Function returning by reference	
2.4	Inline Functions	
2.5	Default Arguments	
2.6	Function overloading	
2.7	Friend function	
2.8	Namespaces	
3.0	Constructors, Destructors and dynamic memory allocation	8
3.1	Declaration	
3.2	Default constructor	
3.3	Parameterized constructor	
3.4	Copy constructor	
3.5	Dynamic constructor	
3.6	Dynamic Initialization of objects	
3.7	Destructor	
3.8	New and delete operators	
3.9	set_new_handler function	
4.0	Operator Overloading	12
4.1	Definition, Declaration and Initialization	
4.2	Overloading Unary operator	
4.3	Overloading Binary operator	
4.4	Overloading “<<” and “>>” operator	
4.5	Overloading new and delete operator	
4.6	Type Conversions	
4.6.1	Basic to User-defined Data type	
4.6.2	User-Defined to Basic Data type	
4.6.3	Class to class Conversion	
	Total	36



VALUABLE LESSONS OF LIFE

- *Don't take everything so serious, have a sense of humor.*
- *People like to help or do business with people they already know, networking is critical. Meet and serve as many people as you can.*
- *You didn't die from your mistakes, but you may have to repeat them, if you didn't learn the lesson.*
- *Stay away from negative, critical, judgmental, gossipy people.*
- *Spend as much time as possible around nature and beautiful environments.*
- *Sometimes things you can't learn in a book or from a parent, teacher or pastor, you have to experience it for yourself.*
- *Acknowledge your shortcomings and work to improve them acknowledge your strengths, be humble but don't diminish or deny them.*
- *I didn't die from the painful times in my life, they made me stronger.*
- *Have a life, don't depend on others to make you happy and fulfilled.*
- *Find ways to show appreciation to those you love and care about, not just on holidays or birthdays.*
- *Pay attention to details and keep good records.*
- *If you take it, return it. If you break it, fix it. If you know it, live it. If you want it, ask for it. If you use it, clean it. If you wear it, hang it up. If made a mistake, take responsibility for it. If you have some share it. If you own it, protect it. If you believe it, you can achieve it.*

“Anything that changes your values changes your behavior.”



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Carry on! Carry on!

When it's ten against one, and hope there is none,

Buck up, little soldier, and try your best

And so in the trouble of the battle of life

It's a different song when everything's wrong.

It's easy to fight when you're winning;

It's easy to slave, and starve and be brave,

When the dawn of success is beginning.

But the man who can meet despair and defeat

With a cheer, there's a man of God's choosing;

The man who can fight to Heaven's own height

Is the man who can fight when he's losing.

Fight the good fight and true;

Believe in you mission, greet life with a cheer;

There's big work to do, and that's why you are here.

It's easy to cheer when victory's near.

Carry on! Carry on!

“Enthusiasm is the genius of sincerity and truth accomplishes no victories without it.”