SARDAR VALLABHBHAI PATEL EDUCATION SOCIETY'S
R. N. G. PATEL INSTITUTE OF TECHNOLOGY - RNGPIT
An Autonomous Institute u/s UGC Act 1956
Approved by AICTE & affiliated to Gujarat Technological University
Bardoli - Navsari Road, At: Isroli (tajpore), Po: Afwa, Tal: Bardoli, Dist: Surat, Pin - 394620
Phone: 95129 00457, 95129 00458 • Email: Info@rngpit.ac.in • Website: www.rngpit.ac.in

Program Name: Int. M.Sc. (I.T.)
Level: Post Graduate
Branch: Information Technology
Subject Code: 2BS203
Subject Name: Data Structure

w. e. f. Academic Year:	2025-26
Semester:	02
Category of the Course:	Major Course

Prerequisite:	C Programming Language
Rationale:	This course covers basic understanding of data structures, algorithms and its implementations.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Explain core concepts of data structures and algorithms
02	Implement stacks and queues using arrays.
03	Demonstrate the use of linked lists.
04	Explore tree concepts.
05	Describe graph terminology and types of graphs.
06	Implement searching and sorting algorithms.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				SEE (TH)	IAT	CCE	SEE (P)	
2	0	4	4	70	30	20	30	150

Where SEE: Semester End Examination, IAT: Internal Assessment Test, CCE: Continuous and Comprehensive Evaluation

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	**Introduction to Data Structure** 1.1 Concepts of structure 1.2 Pointer 1.3 Introduction to Algorithm 1.3.1 Definition and Characteristics 1.3.2 Abstract Data Types 1.3.3 Analysis of Algorithm and Complexity 1.4 Data Structure 1.4.1 Introduction 1.4.2 Need of Data Structure 1.4.3 Types of Data Structure Linear and Non-linear	3	10%
2	**Stack and Queue** 2.1 Stack 2.1.1 Array implementation 2.1.2 Operations on Stack 2.1.3 Stack application : Infix, Postfix, Prefix 2.1.4 Applications of Stack 2.2 Queue 2.2.1 Introduction to Queues 2.2.2 Types of Queue Simple Queue, Circular Queue, Dequeue, Priority queue 2.2.3 Operations on Queues 2.2.4 Implementation of Queue 2.2.5 Applications of Queue	6	20%

3	**Linked List** 3.1 Introduction to Linked list 3.2 Types of Linked List Singly Linked List, Circular Linked list, Doubly Linked List, Circular Doubly Linked list 3.3 Operations of Linked list 3.4 Implementation of Linked list 3.5 Applications of Linked List.	6	20%
4	**Tree** 4.1 Introduction to Tree 4.2 Binary Trees 4.3 Binary Search Tree 4.4 Threaded binary tree 4.5 AVL tree 4.6 B+ tree 4.7 Traversal of binary trees: Preorder, Inorder, Postorder 4.8 Application of Trees	6	20%
5	**Graph** 5.1 Introduction and Terminology of Graph 5.2 Types of Graph	3	10%
6	**Searching and Sorting** 6.1 Introduction to Searching Linear Search and Binary Search 6.2 Introduction to Sorting 6.2.1 Insertion, Selection, Quick, Bubble, and Merge Sort 6.2.2 Comparison of Sorting algorithms	6	20%
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (%)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
40	**40**	**20**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. An introduction to data structures with applications - Trembley & Sorenson, Tata McGraw Hill
2. Data and File Structures using C-Thareja, Oxford University Press
3. Data Structures using C – E. Balagurusamy, McGraw Hill
4. Data Structures Chitra, A Rajan, P T, McGraw Hill
5. Classic Data Structures Samanta & Debasis, PHI Learning

(b) Open-source software and website:

1. data-structure-tutorial(javatpoint.com)
2. data-structure-tutorial(w3school)
3. https://spoken-tutorial.org

Suggested Course Practical List:

Sr. No.	Name of Practical
1.	Write a C program to swap 2 no. using the concept call by value and call by reference.
2.	Write a C program to concatenation of two strings to form a new string.
3.	Write a C program to that will perform following operation on stack. (1) Push (2) Pop (3) Peep (4) Update (5)Display
4.	Write a C program to convert infix notation to prefix and postfix.
5.	Write a C program to implement simple queue.
6.	Write a C program to implement Circular queue.
7.	Write a menu driven C program to implement a concept of singly linked list.
8.	Write a menu driven C program to implement a concept of doubly linked list
9.	Write a C program to perform Binary search.
10.	Write a C program to perform Linear search.
11.	Write a C program to perform Bubble sort.
12.	Write a C program to perform Quick sort.
13.	Write a C program to perform Selection sort.
14.	Write a C program to perform Merge sort.
15.	Write a C program to perform Insertion sort.

* * * * * * *

SARDAR VALLABHBHAI PATEL EDUCATION SOCIETY'S
R. N. G. PATEL INSTITUTE OF TECHNOLOGY - RNGPIT
An Autonomous Institute u/s UGC Act 1956
Approved by AICTE & affiliated to Gujarat Technological University
Bardoli - Navsari Road, At: Isroli (tajpore), Po: Afwa, Tal: Bardoli, Dist: Surat, Pin - 394620
Phone: 95129 00457, 95129 00458 • Email: Info@rngpit.ac.in • Website: www.rngpit.ac.in

Program Name: Integrated M.Sc. (IT)
Level: Post Graduate
Branch: Information Technology
Subject Code: 2BS204
Subject Name: Object Oriented Programming

w. e. f. Academic Year:	2025-26
Semester:	2
Category of the Course:	Major Course

Prerequisite:	C Programming
Rationale:	This course covers fundamentals of C++ programming.

Course Outcome:
After Completion of the Course, Student will be able to:

No	Course Outcomes
01	Explain the fundamental concepts of Object-Oriented Programming and C++.
02	Describe the structure and use of classes and objects.
03	Apply the principles of inheritance to develop modular programs.
04	Implement polymorphism concepts using C++.
05	Use exception handling techniques to manage runtime errors.
06	Utilize templates and STL components for generic programming.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				SEE (TH)	IAT	CCE	SEE (P)	
2	0	4	4	70	30	20	30	150

Where SEE: Semester End Examination, IAT: Internal Assessment Test, CCE: Continuous and Comprehensive Evaluation

Course Content:

Suggested Specification Table with Marks (Theory):

Unit No.	Content	No. of Hours	% of Weightage
1.	**Object-Oriented Programming Concepts** 1.1 Basic concepts of Object-Oriented Programming 1.2 Procedure Oriented Vs Object Oriented Programming 1.3 Benefits of OOP 1.4 Basics of C++ 1.4.1 Data types 1.4.2 Identifiers and constants 1.4.3 Operators, Scope Resolution Operator 1.4.4 Expressions 1.4.5 Control Statements and Iteration	6	**20**
2.	**Class and Object** 2.1 Access Modifiers 2.2 Declaring simple class, member variables and member functions. 2.3 Inline function 2.4 Concepts of Data hiding, abstraction and encapsulation 2.5 Constructors and Destructors	**6**	**20**
3	**Inheritance** 3.1 Concept of Inheritance 3.2 Types of inheritance: Single, Multiple, Multilevel, Hierarchical, and Hybrid inheritance	**3**	**10**
4.	**Polymorphism** 4.1 Concepts of Polymorphism 4.2 Types of Polymorphism 4.3 Concepts of Overloading and Overriding 4.4 Concepts of Friend Function 4.5 Concepts of virtual function and pure virtual function	**6**	**20**
5.	**Exception Handling** 5.1 Concept of exception handling 5.2 Try-catch-throw 5.3 Multiple catch 5.4 User-Defined Exceptions	**3**	**10**

6.	**Templates and STL** 6.1. Class Templates 6.2. Function Templates 6.3. Overloading of Template Functions 6.4. STL: Introduction 6.4.1 Components of STL 6.4.2 Containers 6.4.3 Application of Container Classes	**6**	**20**
	Total	**30**	**100**

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	**40**	**30**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:
(a) Books:

1. Programming In ANSI C++ , E. Balagurusamy,Tata Mc Graw Hill
2. Let Us C++: Authentic Guide to C Programming Language, Yashwant Kanetkar, BPB Publications
3. The Compete Reference C++, Herbert Schlitz, TMH
4. The C++ Programming Language,Stoupstrupt-Addison Wesley
5. OOP in Turbo C++ ,Robert Lafore-Galgotia Publication
6. Object Oriented Programming with C++ | 8th Edition, E.Balagurusamy

(b) Open source software and website:

1. C++ Tutorial (w3schools.com)
2. C++ Programming Language Tutorial - GeeksforGeeks
3. C++ Tutorial (tutorialspoint.com)
4. https://spoken-tutorial.org

Suggested Course Practical List:

Sr. No.	Name of Practical
1	Write a C++ program to display student details.
2	Write a C++ program to Calculate Fahrenheit to Celsius.
3	C++ Program to Make a Simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
4	C++ programs that demonstrate the concept of constructors.
5	Create a class **product** with the following data members pid, price, qty, total_price Write member functions for each of the following a. To get the data b. To display the data c. To calculate the total price of the product
6	C++ program to illustrate the implementation of Single Inheritance.
7	C++ program to illustrate the implementation of Multiple Inheritance.
8	C++ program to illustrate the implementation of Hybrid Inheritance.
9	Write a C++ program for function overriding.
10	Write a C++ program to find volume of cube, cylinder, sphere by function overloading.
11	Write a C++ program to swap private data members of classes named as class1, class2 using friend function.
12	C++ program to illustrate concept of Virtual Functions.
13	Write a C++ program to implement the exception handling with multiple catch statements.
14	Write a C++ program to swap two numbers using template function.
15	Write a C++ program to sum array using template function.

* * * * * * *

SARDAR VALLABHBHAI PATEL EDUCATION SOCIETY'S
R. N. G. PATEL INSTITUTE OF TECHNOLOGY - RNGPIT
An Autonomous Institute u/s UGC Act 1956
Approved by AICTE & affiliated to Gujarat Technological University
Bardoli - Navsari Road, At: Isroli (tajpore), Po: Afwa, Tal: Bardoli, Dist: Surat, Pin - 394620
Phone: 95129 00457, 95129 00458 • Email: Info@rngpit.ac.in • Website: www.rngpit.ac.in

Program Name: Integrated M.Sc. (I.T.)

Level: Post Graduate

Branch: Information Technology

Subject Code: 2BS205

Subject Name: Database Management System

w. e. f. Academic Year:	2025-26
Semester:	02
Category of the Course:	MINOR COURSE

Prerequisite:	**NIL**
Rationale:	This course covers basic understanding of database management systems, overview of types of databases.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand the fundamental concepts of data and databases.
02	Explain the role, components, and functions of a Database Management System
03	Describe various data models and their use in structuring and organizing data.
04	Identify and differentiate between different types of databases and their applications.
05	Apply SQL statements to create, modify, retrieve, and manage data in relational databases.
06	Use SQL functions and operators to perform data manipulation effectively.

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				SEE (TH)	IAT	CCE	SEE (P)	
3	0	4	5	70	30	30	20	150

Where SEE: Semester End Examination, IAT: Internal Assessment Test, CCE: Continuous and Comprehensive Evaluation

Course Content:

Unit No.	Content	No. of Hours	%of Weightage
1.	**Introduction to Database Management System** 1.1 Introduction 1.2 Database System Applications 1.3 Purpose of Database Systems 1.4 View of Data: Instances and Schemas 1.5 Data Independence	6	10%
2.	**Basics of Database Management System** 2.1 Database Design 2.2.Data Storage 2.3 Data Querying 2.4 Database Architecture 2.5 Transaction Management	9	20%
3.	**Data models** 3.1 Types of Data models 3.2 Entity-Relationship Model 3.3 Entity-Relationship Diagram 3.4 Constraints and Design Issues	6	20%

4.	**Types of Databases** 4.1 Object Oriented Database 4.2 Centralized Database 4.3 Distributed Database 4.4 Parallel Database 4.5 Multimedia Database 4.6 NoSQL Database 4.7 Temporal Database 4.8 XML Database	6	10%
5.	**SQL Concepts** 5.1 Basics of SQL 5.2 Types of commands: DDL,DQL,DML,DCL and TCL 5.3 Constraints- Primary key, foreign key, unique, not null	6	20%
6.	**SQL Functions & Operator** 6.1Aggregate functions Built-in functions –numeric, date, string function, 6.2 Having Clause, Group By Clause 6.3Types of Operators 6.4 Sub Queries & View	9	20%
	Total	**42**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	**40**	**30**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Fundamentals of Database Systems", 7th Edition by R. Elmasri and S. Navathe, Pearson
3. "An introduction to Database Systems", C J Date, Pearson.

4. “Modern Database Management”, Hoffer , Ramesh, Topi, Pearson.
5. “Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer Science Press

(b) Open source software and website:

1. https://www.javatpoint.com/dbms-tutorial/
2. https://www.w3schools.in/operating-system/intro

List of Laboratory/Learning Resources Required:

1.	Create an “Account” table having three columns for account number, balance and branch and Display information about columns of an Account Table.
2.	Insert at least 5 data into an Account table.
3.	Insert a new row into an Account table for Bardoli branch containing null balance for account number ‘A06’.
4.	Display all the records of an Account table.
5.	Display only account number and balance for each account.
6.	Display information of each account that belongs to the ‘Surat’ branch.
7.	Display all account numbers having balances more than 6000.
8.	Display branch names from the Account table avoiding the duplication of branch names.
9.	Display all accounts sorted in ascending order according to their branch names.
10.	Display all accounts sorted in descending order according to their balance.
11.	Display all the details of account number ‘A01’.
12.	Create table Acc having all rows and all columns from table Account.

13.	Update account balance of all customer.
14.	Delete First Two Account Number Details from Table.
15.	Display the table Data after Deletion.

* * * * * * *