Regulation: R20	

COMPUTER SCIENCE & ENGINEERING (Minors)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Year/ Sem	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20CSM101	Data Structures	II-II	4	3	1	0	30	70	100
B20CSM201	Operating Systems	III-I	4	3	1	0	30	70	100
B20CSM301	Database ManagementSystem	III-II	4	3	1	0	30	70	100
B20CSM401	Object oriented Programming throughC++	IV-I	4	3	1	0	30	70	100
B20CSM501	*MOOCS-I	II-II to IV-II	2	--	--	--	--	--	100
B20CSM601	*MOOCS-II	II-II to IV-II	2	--	--	--	--	--	100
		TOTAL	**20**	**12**	**4**	**0**	**120**	**280**	**600**

*Two MOOCS courses of any COMPUTER SCIENCE & ENGINEERINGrelated Program Core Courses from NPTEL/SWAYAM with a minimum duration of 8 weeks (2 Credits) courses other than the courses offered need to be takenby prior information to the concern. These courses should be completed between II Year II Semester to IV Year II Semester

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CSM101	**Minor**	**3**	**1**	**0**	**4**	**30**	**70**	**3 Hrs.**

DATA STRUCTURES

(Minor Degree course in CSE)

(Offered to CE, ECE, EEE & ME)

Course Objectives:

1.	Be familiar with basic techniques of algorithm analysis
2.	Master the implementation of data structures like stacks, queues, linked lists, binary trees, graphs.
3.	Be familiar with basic techniques for algorithm development like recursion.
4.	Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort and heap sort.
5.	Master analyzing problems and writing program solutions to problems using the above techniques.

Course Outcomes: By the end of the course, the student will

S.No	Outcome	Knowledge Level
1.	Demonstrate the concept of recursion, the way arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory	K4
2.	Implement stacks, linked lists, queues and trees and apply them to solve different Computer Science problems and Engineering problems.	K3
3.	Compare alternative implementations of data structures with respect to performance.	K3
4.	Apply the principal algorithms for sorting and searching to the given data and analyze the computational efficiency.	K4
5.	Make use of Graphs to solve real life applications.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Basic Concepts:** Arrays, Structures and Unions, Internal Implementation of Structures, Self-Referential Structures **Simple Searching and Sorting Techniques:** Introduction to Searching, Sequential Search, Binary Search, Interpolation Search, Selection Sort, Bubble Sort, Insertion Sort, Introduction to Merge Sort **Introduction to Recursion**: Towers of Hanoi, Quick Sort, Merge Sort

UNIT-II (10 Hrs)	**Stacks, Queues** Stack Abstract Data Type, Queue Abstract Data Type, Stacks and Queues using arrays, Introduction to Evaluation of Expressions, Evaluating Postfix Expressions, Infix to Postfix and Prefix conversion, Circular Queues using arrays. Pointers, Dynamically Allocated Storage using pointers, Dynamically Linked Stacks and Queues
UNIT-III (10 Hrs)	**Linked Lists:** Singly Linked Lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list. **Circular Linked Lists**: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from Circular Linked Lists **Doubly Linked Lists**: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from Doubly LinkedLists, **Polynomials**: Representing Polynomials as Singly Linked Lists, Adding Polynomials
UNIT-IV (10 Hrs)	**Trees:** Representation of Trees, Binary Trees Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversals, **Heap** Abstract Data Type, Insertion into a max heap, Deletion from a max heap, Heap Sort. Introduction to **Binary Search Trees**, Searching a Binary Search Tree, Inserting an Element into a Binary Search Tree, Deleting an Element from a Binary Search Tree, Height of a Binary Search Tree.
UNIT-V (10 Hrs)	**Graphs:** Graph Abstract Data Type, Definitions, Graph Representations, Elementary Graph Operations, Depth First Search, Breadth First Search Spanning Trees, Minimum Cost Spanning Trees, Prim's and Kruskal's Algorithms, Shortest Paths and Transitive Closure, Single Source All Destination - Dijkstra's Algorithm

Text Books:	
1.	Fundamentals of Data Structures in C, 2nd edition, Horowitz, Sahani and Anderson-Freed, Universities Press, 2008.
Reference Books:	
1.	Data Structures using C by Aaron M. Tenenbaum
2.	Data Structures with C by Seymour lipschutz
3.	Data Structures using C by R. Krishna Moorthy G. IndiraniKumaravel

		Course Code: B20CSM101			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R 20**
		II B.Tech. II Semester MODEL QUESTION PAPER			
		DATA STRUCTURES			
		(Minor Degree Course in CSE for CE, ECE, EEE & ME)			
Time: 3 Hrs					**Max. Marks:70**
		Answer **ONE** Question from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain representation of array as an ADT along with their advantages and disadvantages	**1**	**3**	**7**
	b).	Arrange the following list of elements in ascending order using Merge Sort A, L, G, O, R, I, T, H, M, S Clearly show the sorting process at each step.	**1**	**2**	**7**
		OR			
2.	**a).**	Differentiate Structures and Unions.	**1**	**3**	**7**
	b).	Sort the elements using Quick Sort: 52, 38, 81, 22, 48, 13, 69, 93, 14, 45, 58, 79, 72.	**1**	**3**	**7**
		UNIT-II			
3.	**a).**	Define stack ADT. Explain basic operations of a stack ADT.	**2**	**3**	**7**
	b).	Convert the given infix Expression ((A+B)*C-(D-E)^(F+G)) into its Equivalent Prefix and Postfix Notations.	**2**	**3**	**7**
		OR			
4.	**a).**	Explain the procedure to evaluate postfix expression 6 2 3 + - 3 8 2 / + * 2 4 3 +.	**2**	**3**	**7**
	b).	Discuss about implementation of queues using linked list	**2**	**3**	**7**
		UNIT-III			
5.	**a).**	Compare singly and circular linked list while performing insertion and deletion operations	**3**	**4**	**7**
	b).	Explain polynomial addition using linked list with an example.	**3**	**3**	**7**
		OR			
6.	**a).**	List various operations of linked list and explain how to insert a node anywhere in the list.	**3**	**2**	**7**
	b).	Explain various operations performed on doubly Linked Lists	**3**	**2**	**7**
		UNIT-IV			

7.	**a).**	Sketch the binary search tree resulting after inserting the following integer keys 49, 27, 12, 11, 33, 77, 26, 56, 23, 6. i) Check whether the tree is almost complete or not? ii) Determine the height of the tree iii) Write post order and preorder traversals	**4**	**3**	**7**
	b).	Create max heap for the following elements 33, 14, 65, 02, 76, 69, 59, 85, 47, 99, 98.	**4**	**2**	**7**
		OR			
8.	**a).**	A binary tree has seven nodes. The Preorder and Postorder traversal of the tree are given below. Can you draw the tree? Justify. Preorder : GFDABEC Postorder : ABDCEFG	**4**	**3**	**7**
	b).	Write in-order, pre-order and post-order traversal of a binary tree.	**4**	**2**	**7**
		UNIT-V			
9.	**a).**	What is minimum cost spanning tree? Discuss with an example.	**5**	**2**	**7**
	b).	Explain Dijkstras Algorithm with an example	**5**	**3**	**7**
		OR			
10.	**a).**	Discuss Kruskal's algorithm advantages and disadvantages.	**5**	**3**	**7**
	b).	Discuss the Representation of Graphs.	**5**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CSM201	**Minor**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

OPERATING SYSTEMS

(Minor Degree course in CSE)

(Offered to CE, ECE, EEE & ME)

Course Objectives:

1.	Introduce to the internal operation of modern operating systems
2.	Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
3.	Understand File Systems in Operating System like UNIX/Linux and Windows
4.	Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
5	Analyze Security and Protection Mechanism in Operating System

Course Outcomes: At the end of the course Students will be able

S.No	Outcome	Knowledge Level
1.	Describe various generations of Operating System and functions of Operating System, System calls	K2
2.	Describe the concept of process, threads and analyze various CPU Scheduling Algorithms and IPC	K2
3.	Illustrate memory management strategies	K2
4.	illustrate deadlocks, files and Secondary-Storage Structure	K2
5.	Summarize Security and Protection Mechanism in Operating Systems. Understand the Operating System like UNIX/Linux and Windows	K3

SYLLABUS

UNIT-I (6Hrs)	**Operating Systems Overview:** Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems. **System Structures:** Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.
UNIT-II (10Hrs)	**Process Concept:** Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. **Multithreaded Programming:** Multithreading models, Thread libraries, Threading issues. **Process Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

	Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.
UNIT-III (06Hrs)	**Memory-Management Strategies:** Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation. **Virtual Memory Management:** Introduction, Demand paging, Copy on-write, Page replacement, Page replacement Algorithms, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.
UNIT-IV (10Hrs)	**Deadlocks:** Resources, Conditions for resource deadlocks, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention. **File Systems:** Files, Directories, File system implementation, management and optimization. **Secondary-Storage Structure:** Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.
UNIT-V (08Hrs)	**System Protection:** Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. **System Security:** Introduction, Program threats, System and network threats. **Case Studies:** Linux, Microsoft Windows.

Text Books:	
1.	Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2.	Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)
Reference Books:	
1.	Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2.	Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3.	Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105214/

		Course Code: B20CSM201			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R 20**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		OPERATING SYSTEMS			
		(Minor Degree Course in CSE for CE, ECE, EEE & ME)			
Time: 3 Hrs.					**Max. Marks:70**
		Answer **ONE** Question from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain the abstract view of system components.	**1**	**2**	**7**
	b).	Discuss the Simple Operating System Structure.	**1**	**2**	**7**
		OR			
2.	**a).**	Explain different types of Operating Systems.	**1**	**2**	**7**
	b).	Define a System call. Explain the various types of system calls provided by Operating System.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Differentiate one- to- one, many- to-one multi-threading models.	**2**	**2**	**7**
	b).	Explain Dining Philosophers problem? Discuss the solution to Dining Philosopher's problem using monitors.	**2**	**2**	**7**
		OR			
4.	**a).**	Explain Primitive Priority Scheduling Algorithms with an Example?	**2**	**2**	**7**
	b).	Discuss the solution to Reader/Writers Problem using semaphores.	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	Differentiate paging and segmentation.	**3**	**2**	**7**
	b).	Explain briefly the performance of Demand paging with an example.	**3**	**2**	**7**
		OR			
6.	**a).**	Define Page Fault. When does a page fault occur? Describe the action taken by OS when page fault occurs.	**3**	**2**	**7**
	b).	Apply FIFO and LRU page replacement algorithms for the following string to determine the number of page faults. 7 0 1 2 0 3 0 4 2 3 0 2 1 2 0 1 7 0 1 for a memory with '3' frames.	**3**	**3**	**7**

		UNIT-IV			
7.	**a).**	Apply the deadlock detection algorithm to determine deadlock will exist or not for the following system with 5 process and 3 resource types (resource type A has 7 instances, B has 2 instances, and C has 6 instances) Snapshot at time T0 Process Allocation Request Available A B C A B C A B C P0 0 1 0 0 0 0 0 0 0 P1 2 0 0 2 0 2 P2 3 0 3 0 0 0 P3 2 1 1 1 0 0 P4 0 0 2 0 0 2	**4**	**3**	**7**
	b).	Explain various File access methods with Suitable examples	**4**	**2**	**7**
		OR			
8.	**a).**	Explain deadlock avoidance using banker's algorithm with suitable example.	**4**	**2**	**7**
	b).	Apply FCFS, SSTF disk arm scheduling schemes to find total number head movements for the following string 98 183 37 122 14 124 65 67 assume the head pointer at 53.	**4**	**3**	**7**
		UNIT-V			
9.	**a).**	Explain System and Network Threats	**5**	**2**	**7**
	b).	Describe the System Component of Windows XP architecture	**5**	**2**	**7**
		OR			
10.	**a).**	Explain Principles and domain Protections.	**5**	**2**	**7**
	b).	Describe the components of the Linux System	**5**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CSM301	**Minor**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

DATABASE MANAGEMENT SYSTEM

(Minor Degree course in CSE)

(Offered to CE, ECE, EEE & ME)

Course Objectives:

1.	To introduce about database management systems
2.	To give a good formal foundation on the relational model
3.	To introduce the concepts of basic SQL as a universal Database language
4.	To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design and normalization
5.	To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques
6.	To explain Transaction management techniques

Course Outcomes: At the end of the course Students will be able

S.No	Outcome	Knowledge Level
1.	Describe fundamental concepts a relational database	K2
2.	Create, maintain and manipulate a relational database using SQL	K3
3.	Apply Conceptual and Logical database design	K3
4.	Apply normalization for database design	K3
5.	Illustrate Storage management and Transaction management techniques.	K2

SYLLABUS

UNIT-I (8Hrs)	**Introduction:** Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.
UNIT-II (10 Hrs)	**Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance **BASIC SQL:** Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).

UNIT-III (10 Hrs)	**Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, **Generalization/specialization, Aggregation, SQL:** Creating tables with relationships, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views(updatable and non-updatable), relational set operations.
UNIT-IV (10 Hrs)	**Schema Refinement (Normalization):** Purpose of Normalization or schema refinement, concept of functional dependency, Closure of functional dependency and attribute closure, Normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).
UNIT-V (10 Hrs)	**Transaction Concept:** Transaction State, Implementation of Atomicity and Durability, Schedules, Serializability, Recoverability, Implementation of Isolation levels, 2Pl and Time stamp ordering protocols, Failure Classification, Recovery and Atomicity, ARIES Recovery algorithm. **Indexing Techniques:** Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing, B+ Trees: Searching, Insertion, Deletion

Text Books:	
1.	Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 7th Edition, McGraw-Hill Education, 2019.
2.	Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition., McGraw-Hill Education (India), 2014.
Reference Books:	
1.	Database Principles: Fundamentals of Design, Implementation, and Management by Steven Morris, Keeley Crockett, Carlos Coronel, Craig Blewett, Cengage, 2020.
2.	Fundamentals of Database Systems by RamezElmasri, Shamkant B. Navathe, 7th Edition, Pearson Education India, 2015.
3.	Introduction to Database Systems by C J Date, 8th Edition, Pearson Education, 2009.
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://www.geeksforgeeks.org/introduction-to-nosql/

		Course Code: B20CSM301			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		DATA BASE MANAGEMENT SYSTEMS			
		(Minor Degree Course in CSE for CE, ECE, EEE & ME)			
Time: 3 Hrs.					**Max. Marks:70**
		Answer **ONE** Question from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1	**a).**	Compare Database Management Systems with File Processing Systems	**1**	**2**	**8**
	b).	Explain the roles of different database users	**1**	**2**	**6**
		OR			
2	**a).**	Discuss the applications of Database Management Systems	**1**	**2**	**6**
	b).	Describe the structure of a Database Management System	**1**	**2**	**8**
		UNIT-II			
3		Give syntax and apply the SQL commands for defining two example tables of your choice. Then insert data, update data in the tables	**2**	**3**	**14**
		OR			
4		What are relational instances and schemas? How'd you use keys and schemas in relational model?	**2**	**3**	**14**
		UNIT-III			
5	**a).**	Apply conceptual DB design and draw E-R diagram for the following situations by assuming appropriate Attributes i) A Part is supplied by many suppliers at different costs and a supplier supplies many parts ii) An employee works in at most one department and a department has many employees iii) A house has at least and at most one owner and owner has many houses iv) A muslim woman marries at most one man and a muslim man could marry many woman	**3**	**3**	**8**
	b).	Demonstrate set operations in SQL	**3**	**3**	**6**
		OR			
6	**a).**	Demonstrate set operations in SQL	**3**	**3**	**7**
	b).	Illustrate basic features of ER model	**3**	**3**	**7**

		UNIT-IV			
7	**a).**	Apply Loss-less join decomposition into BCNF for an example table	**4**	**2**	**8**
	b).	Apply dependency preserving decomposition into 3NF for an example table	**4**	**2**	**6**
		OR			
8		Illustrate Normal forms from 1 NF to BCNF.	**4**	**3**	**14**
		UNIT-V			
9		What are page tables and Transaction tables? Describe analysis, redo and undo steps of ARIES.	**5**	**2**	**14**
		OR			
10		Explain 2PL and time stamp ordering protocols	**5**	**2**	**14**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CSM401	**Minor**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

OBJECT ORIENTED PROGRAMMING THROUGH C++

(Minor Degree course in CSE)

(Offered to CE, ECE, EEE & ME)

Course Objectives:

1.	Understand the syntax and principles of Object Oriented Programming.
2.	Design and development of secure and extendable C++ applications.
3.	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
4.	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
5.	Demonstrate the use of various OOP's concepts with the help of programs.

Course Outcomes: At the end of the course Students will be able

S. No	Outcome	Knowledge Level
1.	Illustrate the process of Object Oriented Paradigm.	K2
2.	Demonstrate classes, member functions, constructors and their importance in developing real world applications.	K3
3.	Apply C++ features such as Inheritance, operator overloading to make programs reusable.	K3
4.	Understand Dynamic Memory Management techniques using pointers.	K2
5.	Apply the concept of Generic Programming and Exception handling to build an efficient and error free code.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to C++:** Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantages of OOP's, Object Oriented Language.
UNIT-II (10 Hrs)	**Classes and Objects:** Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class. **Constructors and Destructors:** Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments, Parameterized Constructor, Destructors, Anonymous Objects

UNIT-III (10 Hrs)	**Operator Overloading, Type Conversion and Inheritance:** The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes, Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.
UNIT-IV (10 Hrs)	Pointers: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class. **Binding Polymorphisms and Virtual Functions:** Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.
UNIT-V (10 Hrs)	**Generic Programming with Templates & Exception Handling:** Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, and The Keywords- try throw and catch, Multiple Catch Statements, Specifying Exceptions. Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.
Text Books:	
1.	A First Book of C++, 4th Edition, Gary Bronson, Cengage Learning.
2.	The Complete Reference, C++, 5th Edition, Herbert Schildt, McGraw-Hill Education.
Reference Books:	
1.	Object Oriented Programming C++, Joyce Farrell, Cengage Learning.
2.	C++ Programming: from problem analysis to program design, 6th Edition, DS Malik, Cengage Learning
3.	Programming in C++, Ashok N Kamthane, and Pearson.
4.	Object Oriented Programming using C++, 8th Edition, E.Balaguruswamy, PHI
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105151/
2.	https://github.com/topics/object-oriented-programming

		Course Code: B20CSM401			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		IV B.Tech. I Semester MODEL QUESTION PAPER			
		OBJECT ORIENTED PROGRAMMING THROUGH C++			
		(Minor Degree Course in CSE for CE, ECE, EEE & ME)			
Time: 3 Hrs.					**Max. Marks:70**
		Answer **ONE** Question from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Discuss the differences between C and C++	**1**	**2**	**7**
	b).	Explain about disadvantages of conventional programming.	**1**	**2**	**7**
		OR			
2.	**a).**	Explain about key concepts of Object Oriented Programming.	**1**	**2**	**8**
	b).	Explain about advantages of OOPS.	**1**	**2**	**6**
		UNIT-II			
3.	**a).**	Explain Classes, Objects and Member Functions.	**2**	**3**	**6**
	b).	Write a C++ program to overload area() and perimeter() function to calculate area of shapes like triangle, square, circle and rectangle.	**2**	**3**	**8**
		OR			
4.	**a).**	How will you destroy the objects initialized by the constructor in the program?	**2**	**3**	**5**
	b).	Explain the use of different constructors (default, parameterized and copy constructors) with suitable examples.	**2**	**3**	**9**
		UNIT-III			
5.	**a).**	Explain inheritance with the advantages and disadvantages.	**3**	**3**	**8**
	b).	Illustrate the visibility of base class members for the access specifiers: private, protected and public while creating the derived class and also explain the syntax for creating derived class.	**3**	**3**	**6**
		OR			
6.	**a).**	What are the various types of situations that might arise and can be handled in data conversion between incompatible types?	**3**	**3**	**7**
	b).	Write C++ Program to overload + operator to add two matrices.	**3**	**3**	**7**

		UNIT-IV			
7.	**a).**	Explain virtual classes and their need while building class hierarchy.	**4**	**2**	**7**
	b).	Explain the role of this pointer in C++ with a programming example.	**4**	**2**	**7**
		OR			
8.	**a).**	How does polymorphism promote extensibility? Illustrate	**4**	**2**	**6**
	b).	With a program explain how late binding can be achieved in C++.	**4**	**2**	**8**
		UNIT-V			
9.	**a).**	Explain Class Template and Function Template	**5**	**2**	**8**
	b).	Write a C++ program that illustrates exception handling with the help of keywords: try, throws and catch.	**5**	**3**	**6**
		OR			
10.	**a).**	What is STL? Briefly explain the use of containers, vectors, lists and maps.	**5**	**2**	**7**
	b).	Write a C++ program for Generic Bubble Sort using Template Functions.	**5**	**3**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks