Course Plan

CHITKARA UNIVERSITY

A. Course Handout(Version 1.0)

Institute/School Name	Chitkara University Institute of Engineering and Technology		
Department Name	Department of Computer Science & Engineering		
Programme Name	Bachelor of Engineering (B.E.), Computer Science & Engineering		
Course Name	Object Oriented Programming	Session	2024-2025
Course Code	22CS006	Semester/Batch	3rd/2023
L-T-P (Per Week)	4-0-4	Course Credits	06
Course Coordinator	Dr. Jatin Arora		

CLO01	Understand C++ language features, basics of problem solving aspects for logic building by using data types, variables, operators and expressions.
CLO02	Choose the appropriate object oriented programming constructs to solve the problems using classes, objects, recursion and constructors.
CLO03	Apply inheritance, early binding and late binding in C++ to formulate new solutions for programming problems.
CLO04	Determine the bugs in a program using exceptional handling and recognize basic need of templates.
CLO05	Design and develop reusable and modular code for collaborative team based software development.

1. Objectives of the Course

The course provides a wide scope of learning & understanding of the subject. The main objectives of the course are :

- To formulate proficient solutions of programming problems using object oriented constructs.
- To demonstrate the importance of major features of object oriented programming such as encapsulation, inheritance, code extensibility, reusability, and polymorphism.
- To customize their own templates and implement the generic programming.
- To evaluate and improve the existing programs using Standard Template Library.

2. Course Learning Outcomes

After completion of the course, student should be able to:

Sr. No	Course Outcome	*POs	**CL	***KC	Sessions
CLO01	Understand C++ language features, basics of problem solving aspects for logic building by using data types, variables, operators and expressions.	PO1,PO2,PO4,PO5, PO9,PO12	K2	Factual Conceptual	16
CLO02	Choose the appropriate object oriented programming programming constructs to solve the problems using classes, objects, recursion and constructors.	PO1,PO2,PO4,PO5, PO12	K3	Conceptual Procedural	20

CLO03	Apply inheritance, early binding and late binding in C++ to formulate new solutions for programming problems.	PO1,PO3,PO4,PO5, PO11,PO12	K4	Conceptual Procedural	14
CLO04	Determine the bugs in a program using exceptional handling and recognize basic need of templates.	PO1,PO3,PO5, PO10,PO11	K3	Procedural	16
CLO05	Design and develop reusable and modular code for collaborative team based software development	PO2,PO4,PO9, PO10,PO11	K4	Procedural	14
Total Contact Hours					80

Revised Bloom's Taxonomy Terminology
* PO's available at
**Cognitive Level =CL
***Knowledge Categories = KC

CLO-PO mapping grid |Program outcomes (POs) are available as a part of Academic Program Guide (APG)

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CLO01	H	L		M	H				M			M
CLO02	M	L	M	M	M							M
CLO03	L		M		M						L	M
CLO04	M		H		H						L	
CLO05		M		H					H	M	M	

H=High, M=Medium, L=Low

3. ERISE Grid Mapping

Feature Enablement	Level(1-5, 5 being highest)
Entrepreneurship	2
Research	1
Innovation	3
Skills	5
Employability	4

4. **Recommended Books:**

Text Books:

B01: 'Object Oriented Programming with C++' by E Balagurusamy, 6th Edition, Tata McGraw Hill.
B02: Object Oriented Programming in C++' by Robert Lafore, 4th Edition, Galgotia.
B03: The Complete Reference C++' by Herbert Schildt , 4th Edition ,Tata McGraw Hill.
B04: Stroustrup, Bjarne, The C++ Programming Language, Pearson Education .
B05: Lippman, S.B. and Lajoie, J., C++Primer, Pearson Education .
B06: C-The Complete Reference, Herbert Schildt,4th edition, McGraw Hill Education, 2017
B07: The C Programming Language, Brian W. Kernighan, and Dennis M. Ritchie, 2nd Edition, Pearson, 2015
E-Resourses:
- https://library.chitkara.edu.in/subscribed-books.php
- https://www.sciencedirect.com/science/article/pii/B9780123507723500069?via%3Dihub

5. **Other readings and relevant websites:**

Serial No	Link of Journals, Magazines, websites and Research Papers
1.	http://www.cprogramming.com/tutorial/c++-tutorial.html
2.	http://www.cplusplus.com/doc/tutorial/
3.	http://www.tenouk.com/cncplusplustutorials.html
4.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-088-introduction-to-c-memory-management-and-c-object-oriented-programming-january-iap-2010/

6. **Recommended Tools and Platforms**

GCC Compiler

7. **Course Plan:**

Lecture Number	Topics	Text Book
1-2	History of programming language- complexity and security, Introduction to basic concepts of object-oriented programming- concept of data hiding, abstraction, encapsulation, inheritance and polymorphism	B01,B06
3-4	Comparison between procedural programming paradigm and object-oriented programming paradigm , Problem solving strategies- Top Down, Bottom up, Problems on array	B06, B07
5-6	Inline functions, default arguments, function prototyping	B01
7-8	Function overloading, call by reference, call by value , call by pointer, return by reference	B01
9-10	Introduction to Name Space, Specifying a class, Creating class objects	B01
11-12	Accessing class members, Access specifiers – public, private, and protected (Explain with inheritance), Objects and memory	B01
13-14	Static members, Static objects, constant member function, constant objects	B01
15-16	Friend functions, friend class, Passing Object as an argument (by value, by reference, by address), Returning object from a function.	B01,B02

17-18	Need for constructors and destructors, Copy constructor and Deep Copy, Dynamic constructors	B01,B02
19-20	Destructors, Constructors and destructors with static members	B01
21-22	Defining operator overloading, Rules for overloading operators, Overloading of unary operators	B01,B02
23-24	Binary operators (+, -, /, *), binary operators using friend functions, manipulation of strings using operators Overloading (>, <, = =)	B01,B02
ST-1 (Lecture 1-24)		
25-26	Type conversion: Basic type to class type, Class type to basic type, Class to class type.	B01
27-28	Understanding pointers, Accessing address of a variable, Declaring & initializing pointers, Accessing a variable through its pointer	B01,B02
29-30	Pointer arithmetic, Pointer to a pointer, Pointer to a function	B01,B02
31-32	Dynamic memory management - new and delete Operators, Pointers and classes, Pointer to an object, Pointer to a member	B01,B02
33-34	this Pointer, Possible problems with the use of pointers - Dangling/wild pointers, Null pointer assignment, Memory leak and allocation failures	B01,B02
35-36	Introduction- concept of reuse, Defining derived classes	B01,B02
37-38	Forms of inheritance (single, multilevel, multiple, hybrid & hierarchical)	B01,B02
39-40	Ambiguity in multiple and multipath inheritance (Diamond Problem)	B01,B02
41-44	Inheritance with constructor, Function Overriding Vs Function Overloading	B01
45-46	Concept of Binding, Early binding and late binding,	B02
47-48	Virtual functions, Pure virtual functions,	B02
ST-2 (Lecture 1-48)		
49-50	Abstract classes, Virtual destructors & polymorphism, Order of execution of Virtual functions	B01,B02
51-52	Overriding member functions, Accessing base class functions	B01,B02
53-54	Order of execution of constructors and destructors, Problems on strings	B01
55-56	Review of traditional error handling, Basics of exception handling	B01
57-58	Exception handling mechanism, Throwing mechanism, Catching mechanism	B01
59-60	Re-throwing an exception, Specifying exceptions, Problems on recursion	B01
61-62	Concept of streams, Input/ Output using Overloaded operators >> and << and Member functions of I/O stream classes.	B01
63-64	File streams, Hierarchy of file stream classes	B01
ST-3 (Lecture 1-64)		
65-66	Error handling during file operations	B01
67-68	Reading/Writing of files accessing records randomly	B01

69-72	Standard Template Library: Containers	B03, B05
73-76	Standard Template Library: Iterators and Algorithms.	B03, B05
77-78	Standard Template Library: Vectors	B03, B05
79-80	Standard Template Library: list and map	B03, B05
ETE (Lecture 1-80)		

8. **Delivery/Instructional Resources**

Lecture Number	Topics	Web References	Audio-Video
1-2	History of programming language-complexity and security, Introduction to basic concepts of object-oriented programming- concept of data hiding, abstraction, encapsulation, inheritance and polymorphism	https://www.geeksforgeeks.org/the-evolution-of-programming-languages/	https://onlinecourses.nptel.ac.in/noc24_cs125/preview
3-4	Comparison between procedural programming paradigm and object-oriented programming paradigm, Problem solving strategies- Top Down, Bottom up, Problems on array	https://www.javatpoint.com/procedural-programming-vs-object-oriented-programming	https://onlinecourses.nptel.ac.in/noc24_cs125/preview
5-6	Inline functions, default arguments, function prototyping	https://ocw.mit.edu/courses/6-096-introduction-to-c-january-iap-2011/resources/mit6_096iap11_lec03/	https://www.youtube.com/watch?v=efXI8anQwXo&list=PLEAYkSg4uSQ2qzihjdDEseWrrY1DyxH9P
7-8	Function overloading, call by reference, call by value , call by pointer, return by reference	https://ocw.mit.edu/courses/6-096-introduction-to-c-january-iap-2011/resources/mit6_096iap11_lec03/	https://www.youtube.com/watch?v=efXI8anQwXo&list=PLEAYkSg4uSQ2qzihjdDEseWrrY1DyxH9P
9-10	Introduction to Name Space, Specifying a class, Creating class objects	https://www.cse.iitb.ac.in/~cs101/2019.1/lectures/Lecture20.pdf	https://www.youtube.com/watch?v=i_5pvt7ag7E
11-12	Accessing class members, Access specifiers – public, private, and protected (Explain with inheritance), Objects and memory		
13-14	Static members, Static objects, constant member function, constant objects	https://ocw.mit.edu/courses/6-096-introduction-to-c-january-iap-2011/	https://www.youtube.com/watch?v=i_5pvt7ag7E

15-16	Friend functions, friend class, Passing Object as an argument (by value, by reference, by address), Returning object from a function.	https://ocw.mit.edu/courses/6-096-introduction-to-c-january-iap-2011/	https://www.youtube.com/watch?v=i_5pvt7ag7E
17-18	Need for constructors and destructors, Copy constructor and Deep Copy, Dynamic constructors	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes	https://www.youtube.com/watch?v=uIjgl6qBfFc https://www.youtube.com/watch?v=oRBK0Mh_gG0
19-20	Destructors, Constructors and destructors with static members	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes	https://www.youtube.com/watch?v=uIjgl6qBfFc https://www.youtube.com/watch?v=oRBK0Mh_gG0
21-22	Defining operator overloading, Rules for overloading operators, Overloading of unary operators	https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp4_PointerReference.html https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/	https://www.youtube.com/watch?v=Z_0xXmOgYtY https://www.youtube.com/watch?v=nAGjoysNM4s
23-24	Binary operators (+, -, /, *), binary operators using friend functions, manipulation of strings using operators Overloading (>, <, = =)	https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp4_PointerReference.html https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/	https://www.youtube.com/watch?v=Z_0xXmOgYtY https://www.youtube.com/watch?v=nAGjoysNM4s
25-26	Type conversion: Basic type to class type, Class type to basic type, Class to class type.	https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp4_PointerReference.html https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/	https://www.youtube.com/watch?v=Z_0xXmOgYtY https://www.youtube.com/watch?v=nAGjoysNM4s

27-28	Understanding pointers, Accessing address of a variable, Declaring & initializing pointers, Accessing a variable through its pointer	https://www.w3schools.com/cpp/cpp_pointers.asp	https://www.youtube.com/watch?v=cVLw5HeL3JM
29-30	Pointer arithmetic, Pointer to a pointer, Pointer to a function	https://www.w3schools.com/cpp/cpp_pointers.asp	https://www.youtube.com/watch?v=cVLw5HeL3JM
31-32	Dynamic memory management - new and delete Operators, Pointers and classes, Pointer to an object, Pointer to a member	https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp4_PointerReference.html https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/	https://www.youtube.com/watch?v=Z_0xXmOgYtY https://www.youtube.com/watch?v=nAGjoysNM4s
33-34	this Pointer, Possible problems with the use of pointers - Dangling/wild pointers, Null pointer assignment, Memory leak and allocation failures	https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp4_PointerReference.html https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/	https://www.youtube.com/watch?v=Z_0xXmOgYtY https://www.youtube.com/watch?v=nAGjoysNM4s
35-36	Introduction- concept of reuse, Defining derived classes	https://www.w3schools.in/cplusplus-tutorial/inheritance/	https://www.youtube.com/watch?v=jflvIa60EAg
37-38	Forms of inheritance (single, multilevel, multiple, hybrid & hierarchical)	https://www.w3schools.in/cplusplus-tutorial/inheritance/	https://www.youtube.com/watch?v=jflvIa60EAg
39-40	Ambiguity in multiple and multipath inheritance (Diamond Problem)	https://www.w3schools.in/cplusplus-tutorial/inheritance/	https://www.youtube.com/watch?v=jflvIa60EAg
41-44	Inheritance with constructor, Function Overriding Vs Function Overloading	https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fjpwebdevelopers.in%2Fppts%2Finheritance.pptx&wdOrigin=BROWSELINK	https://www.youtube.com/watch?v=8fDao3MBbwk
45-46	Concept of Binding, Early binding and late binding,	https://www.w3schools.in/cplusplus-tutorial/polymorphism/	https://www.youtube.com/watch?v=jflvIa60EAg
47-48	Virtual functions, Pure virtual functions,	https://www.w3schools.in/cplusplus-tutorial/polymorphism/	https://www.youtube.com/watch?v=jflvIa60EAg

49-50	Abstract classes, Virtual destructors & polymorphism, Order of execution of Virtual functions	https://www.geeksforgeeks.org/virtual-destructor/	https://www.youtube.com/watch?v=DJS9eSN4jAc
51-52	Overriding member functions, Accessing base class functions	https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fjpwebdevelopers.in%2Fppts%2Finheritance.pptx&wdOrigin=BROWSELINK	https://www.youtube.com/watch?v=8fDao3MBbwk
53-54	Order of execution of constructors and destructors, Problems on strings	https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fjpwebdevelopers.in%2Fppts%2Finheritance.pptx&wdOrigin=BROWSELINK	https://www.youtube.com/watch?v=8fDao3MBbwk
55-56	Review of traditional error handling, Basics of exception handling	https://www.coursehero.com/file/129688644/Lecture-9-Exception-handlingppt/	https://www.youtube.com/watch?v=-frZ8btNBSU
57-58	Exception handling mechanism, Throwing mechanism, Catching mechanism	https://www.coursehero.com/file/129688644/Lecture-9-Exception-handlingppt/	https://www.youtube.com/watch?v=-frZ8btNBSU
59-60	Re-throwing an exception, Specifying exceptions, Problems on recursion	https://www.coursehero.com/file/129688644/Lecture-9-Exception-handlingppt/	https://www.youtube.com/watch?v=-frZ8btNBSU
61-62	Concept of streams, Input/ Output using Overloaded operators >> and << and Member functions of I/O stream classes.	https://www.geeksforgeeks.org/cpp-stl-tutorial/ https://courses.cs.washington.edu/courses/cse333/18su/lectures/14-c++-STL.pdf	https://www.youtube.com/watch?v=W7uB9-TKfTg
63-64	File streams, Hierarchy of file stream classes	https://www.w3schools.com/cpp/cpp_files.asp	https://www.youtube.com/watch?v=I0jbnrJM5zY&list=PLiekDZFMHZAxPhb6UYI3N1IrQzpsMRh6Y
65-66	Error handling during file operations	https://www.w3schools.com/cpp/cpp_files.asp	https://www.youtube.com/watch?v=I0jbnrJM5zY&list=PLiekDZFMHZAxPhb6UYI3N1IrQzpsMRh6Y
67-68	Reading/Writing of files accessing records randomly	https://www.w3schools.com/cpp/cpp_files.asp	https://www.youtube.com/watch?v=I0jbnrJM5zY&list=PLiekDZFMHZAxPhb6UYI3N1IrQzpsMRh6Y
69-72	Standard Template Library: Containers	https://www.geeksforgeeks.org/cpp-stl-tutorial/	https://www.youtube.com/watch?v=W7uB9-TKfTg
73-76	Standard Template Library: Iterators and Algorithms.	https://www.geeksforgeeks.org/cpp-stl-tutorial/	https://www.youtube.com/watch?v=W7uB9-TKfTg

77-78	Standard Template Library: Vectors	https://www.geeksforgeeks.org/cpp-stl-tutorial/	https://www.youtube.com/watch?v=W7uB9-TKfTg
79-80	Standard Template Library: list and map	https://www.geeksforgeeks.org/cpp-stl-tutorial/	https://www.youtube.com/watch?v=W7uB9-TKfTg

9. **Lab Plan**

Sr. No.	Lab Number	Experiments	Learning Resource
1	1-2	P1 Factorial of a number P2 Swap two numbers without using third one P3 Sum of a set of numbers	https://www.geeksforgeeks.org/program-for-factorial-of-a-number/ https://www.geeksforgeeks.org/swap-two-numbers-without-third-variable-in-cpp/ https://www.geeksforgeeks.org/cpp-program-to-find-sum-of-first-n-natural-numbers/
2	3-4	P1 Functions to Display String P2 Print Kth largest number	https://www.programiz.com/cpp-programming/strings https://www.geeksforgeeks.org/k-largestor-smallest-elements-in-an-array/
3	5-8	P1 Create Class - Rectangle P2 Find occurrences of palindrome words in a string	https://www.tutorialspoint.com/cplusplus-program-to-create-one-rectangle-class-and-calculate-its-area https://www.geeksforgeeks.org/java-program-count-number-palindrome-words-sentence/
4	9-10	P1 Create Class - Date P2 Capitalize the first letter of each word	https://www.tutorialspoint.com/cplusplus/cpp_date_time.htm https://www.w3resource.com/cpp-exercises/string/cpp-string-exercise-3.php
5	11-12	P1 Create class - Box P2 Create Class - TimeSpan	https://www.tutorialspoint.com/cplusplus/cpp_classes_objects.htm#:~:text=C%2B%2B%20Class%20Definitions&text=class%20Box%20%7B%20public%3A%20double%20length,the%20class%20that%20follows%20it https://reference.aspose.com/slides/cpp/system/timespan/
6	13-16	P1 Class - ComplexNumber P2 Create Class - ArrayClass	https://www.geeksforgeeks.org/cpp-program-to-add-two-complex-numbers/ https://www.geeksforgeeks.org/array-class-c/
7	17-18	P1 Create Class – Distance Calculator	https://www.programiz.com/cpp-programming/examples/inch-feet-structure https://www.programiz.com/cpp-programming/string-class

8	19-22	P1 Cut the sticks P2 Class - IntValue	https://www.geeksforgeeks.org/minimize-number-of-cuts-required-to-break-n-length-stick-into-n-unit-length-sticks/
9	23-24	P1 Inheritance : Actors P2 Inheritance : CalculateBill P3 Inheritance : BookCD	https://www.tutorialride.com/cpp-inheritance-programs/create-item-wise-bill-c-program.htm
10	25-26	P1 Inheritance : Memory Calculator P2 Inheritance : Dice	https://www.programiz.com/cpp-programming/memory-management
11	27-30	P1 Catch multiple exceptions P2 Password too short Exception P3 Valid email address	https://www.programiz.com/cpp-programming/exception-handling https://www.geeksforgeeks.org/taking-password-as-input-in-cpp/ https://www.geeksforgeeks.org/check-if-given-email-address-is-valid-or-not-in-cpp/
12	31-32	P1 Find cumulative sum of a vector	https://www.geeksforgeeks.org/how-to-find-the-cumulative-sum-of-array-in-cpp/
13	33-34	P1 Find mean of a vector P2 Find the numbers appearing thrice	https://www.geeksforgeeks.org/find-average-of-all-elements-in-a-vector-in-cpp/ https://www.geeksforgeeks.org/find-all-array-elements-occurring-more-than-⌊n-3⌋-times/
14	35-36	P1. Count in range from a vector	https://www.tutorialspoint.com/count-elements-in-a-vector-that-match-a-target-value-or-condition-in-cplusplus
15	37-40	P1 Find minimum of a template array P2 Check for balanced parentheses in string	https://www.geeksforgeeks.org/how-to-find-the-minimum-and-maximum-element-of-an-array-using-stl-in-c/ https://www.tutorialspoint.com/check-for-balanced-parentheses-in-an-expression-in-cplusplus

10. Action plan for different types of learners

Slow Learners	Average Learners	Fast Learners
Remedial Classes Doubt Sessions Guided Tutorials Use of audio and visual material	Pre-coded algorithms to illustrate concepts E-notes and E-exercises to read ahead of the pedagogic material	Design solutions for complex problems Coding Competitions, Project

11. Evaluation Scheme & Components:

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment
Component 2	Sessional Tests (STs)	03*	40%	Online platform
Component 3	End Term Examination	01**	60%	Online platform

Total	100%

*Students will have to appear in all Sessional Tests.

Makeup Examination will compensate for either ST1 or ST2 (Only for genuine cases, based on the Dean's approval).

**As per Academic Guidelines, a minimum of 75% attendance is required to become eligible for appearing in the End Semester Examination.

12. Syllabus of the Course:

S. No.	Topic (s)	No. of Sessions	Weightage %
1	History of programming language- complexity and security, Introduction to basic concepts of object-oriented programming- concept of data hiding, abstraction, encapsulation, inheritance and polymorphism Comparison between procedural programming paradigm and object-oriented programming paradigm , Problem solving strategies- Top Down, Bottom up, Problems on array Inline functions, default arguments, function prototyping Function overloading, call by reference, call by value , call by pointer, return by reference, Introduction to Name Space, Specifying a class, Creating class objects, Accessing class members, Access specifiers – public, private, and protected (Explain with inheritance), Objects and memory Static members, Static objects, constant member function, constant objects, Friend functions, friend class, Passing Object as an argument (by value, by reference, by address), Returning object from a function. Need for constructors and destructors, Copy constructor and Deep Copy, Dynamic constructors Destructors, Constructors and destructors with static members, Defining operator overloading, Rules for overloading operators, Overloading of unary operators Binary operators (+, -, /, *), binary operators using friend functions, manipulation of strings using operators Overloading, (>, <, = =)	24	30%
	Sessional Test -1		
2	Type conversion: Basic type to class type, Class type to basic type, Class to class type. Understanding pointers, Accessing address of a variable, Declaring & initializing pointers, Accessing a variable through its pointer, Pointer arithmetic, Pointer to a pointer, Pointer to a function, Dynamic memory management - new and delete Operators, Pointers and classes, Pointer to an object, Pointer to a member this Pointer, Possible problems with the use of pointers - Dangling/wild pointers, Null pointer assignment, Memory leak and allocation failures, Introduction- concept of reuse, Defining derived classes, Forms of inheritance (single, multilevel, multiple, hybrid & hierarchical) Ambiguity in multiple and multipath inheritance (Diamond Problem) Inheritance with constructor, Function Overriding Vs Function Overloading ,Concept of Binding, Early binding and late binding, Virtual functions, Pure virtual functions.	48	60%
	Sessional Test -2		
3	Abstract classes, Virtual destructors & polymorphism, Order of execution of Virtual functions. Overriding member functions, Accessing base class functions, Order of execution of constructors and destructors, Problems on strings, Review of traditional error handling, Basics of exception handling Exception handling mechanism, Throwing mechanism, Catching mechanism, Re-throwing an exception, Specifying exceptions,	64	80%

	Problems on recursion, Concept of streams, Input/ Output using Overloaded operators >> and << and Member functions of I/O stream classes. File streams, Hierarchy of file stream classes		
	Sessional Test -3		
4	Error handling during file operations. Reading/Writing of files accessing records randomly Standard Template Library: Containers Standard Template Library: Iterators and Algorithms. Standard Template Library: Vectors, Standard Template Library: list and map	**80**	**100%**
	End Term Examination (ETE)		

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Dr. Jatin Arora	
Head-Academic Delivery	Dr. Mrinal Paliwal	
Dean	Dr. Rishu Chhabra	
Dean Academics	Dr. Monit Kapoor	
Date	26.06.2024	