Course Plan

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 usingclasses, 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	22
CLO02	Choose the appropriate object oriented programming programming constructs to solve the problems using	PO1,PO2,PO4,PO5, PO12	K3	Conceptual Procedural	19

	classes, objects, recursion and constructors.				
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	18
CLO04	Determine the bugs in a program using exceptional handling and recognize basic need of templates.	PO1,PO3,PO5, PO10,PO11	K3	Procedural	20
CLO05	Design and develop reusable and modular code for collaborative team based software development	PO2,PO4,PO9, PO10,PO11	K4	Procedural	21
Total Contact Hours					100

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

3. 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

4. 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/

5. Recommended Tools and Platforms

Code Blocks
GCC Compiler
Coding Ninjas

6. Course Plan:

Lecture Number	Topics
1-5	Fundamental and problem solving aspect using C, Introduction to Structures, typedef, pointers and nesting structures, functions, structures assignments and arrays, structure members alignment, Padding and Packing, Bit Fields in C, Union and Enumeration, compilation process
6-9	File Handling, Pointer with const keyword , Inline functions, function pointers, sorting using function pointers , sorting using qsort() in C, variable number of parameters in functions
10-14	Advanced concept-Stacks using arrays, Reverse string using stacks, balanced brackets, postfix evaluation, prefix evaluation and infix to postfix conversion, queues using Arrays, Circular queues
15-16	Introduction to basic concepts of object-oriented programming, ProceduralProgramming versus Object Oriented Programming paradigm, Structures versus Classes, Variables and Data Types in C++, Console I/O, Preprocessor directives
17-18	Decision making (if, if-else, if- else-if ladder, switch case, go to), Repetitive Constructs(for, while, do-while, break, continue)
19-20	Arrays (1D, 2D, multi dimensional), Understanding pointers, Accessing address of a variable, Declaring & initializing pointers, Accessing a variable through its pointer, Pointer arithmetic, Pointer to a pointer, Accessing arrays using pointer
21-23	Functions in C++ : Inline functions, Default arguments, Function prototyping, FunctionOverloading
24-25	Introduction to Pointers in C++, Parameter passing techniques, Pointer Arithmetic inC++, Pointer Arithmetic with Pointers

Course Plan

26-28	Dynamic memory management & Pointers - new and delete Operators, this Pointer, Possible problems with the use of pointers - Dangling/wild pointers, Null pointer assignment, Memory leak and allocation failures
29-31	Recursion in C++: Recap of Recursion, Recursion Examples, Order of Execution
32-34	Direct & Indirect Recursion Stack Overflow, Tail & Non-tail Recursion
35-38	Classes and Objects: OOps Paradigm and its features, Specifying a class, Creating classobjects, Accessing class members.
39-44	Access specifiers – public,private,and protected, 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 and by address), Returningobject from a function.
45-48	Constructors and Destructors: Need for constructors and destructors, , Constructoroverloading, Copy constructor, Dynamic constructors, Destructors, Constructors and destructors with static members.
49-54	Operator Overloading: Defining operator overloading, Rules for overloading operators, Overloading of unary operators, Binary operators(+,-,/,*), Binary operators using friendfunctions, Manipulation of strings using operators Overloading(>,<,= =) , Type conversion: Basic type to class type, Class type to basic type, Class to class type.
55-58	Inheritance: Introduction, Defining derived classes, Forms of Inheritance(single,multilevel, multiple)
59-63	Hybrid & hierarchical inheritance, ambiguity in multiple and multipath inheritance
64-66	Inheritance with constructor, Overriding member functions, Order of execution ofconstructors and destructors.
67- 70	Virtual base class, Overriding member functions
71-75	Concept of Binding - Early binding and late binding, Virtual functions, Pure virtualfunctions, Abstract classes
76-79	Virtual destructors & polymorphism
80-84	Exception Handling: Review of traditional error handling, Basics of exception handling,
85-87	Exception handling mechanism, Throwing mechanism, Catching mechanism,Rethrowing an exception, Specifying exceptions.
88-90	Function templates, Class templates, Overloading of template functions.
91-93	Introduction to the Standard Template Library (Containers, Algorithms,Iterators,Vectors) : Sequence Container: vector(push_back(),pop_back(),back(),size(),empty()), list(push_front(),pop_front(),front(),size(),empty()) dequeue(push_back(),pop_back(),push_front(),pop_front(),size(),empty())
94-97	Associative Container: set(Insert(),erase(),Size(),Empty(),Count(),Clear()), multiset(Insert(),erase(),Size(),Empty(),Count(),Clear()), map(Insert(),erase(),Size(),Empty(),Count(),Clear()), multimap(Insert(),erase(),Size(),Empty(),Count(),Clear())
98-100	Derived Container: stack, queue, priority_queue, ALGORITHMS: count(),count_if(),find(),find_if(),copy(),fill(),remove(), remove_copy(), replace(), replace_copy(),reverse(),reverse_copy(), unique(),unique_copy(),max(), max_element(), min(),min_element(), iterators: input, output, forward, vectors:back(),begin(),clear(),empty(),end(), erase(),pop_back(),push_back()

7. Delivery/Instructional Resources

Lecture No.	Topics	Web References	Audio-Video
1-5	Fundamental and problem solving aspect using C, Introduction to Structures, typedef, pointers and nesting structures, functions, structures assignments and arrays, structure members alignment, Padding and Packing, Bit Fields in C, Union and Enumeration, compilation process	https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/	https://nptel.ac.in/courses/106105171
6-9	File Handling, Pointer with const keyword, Inline functions, function pointers, sorting using function pointers , sorting using qsort() in C, variable number of parameters in functions	https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/resources/mit6_087iap10_lec07/	https://nptel.ac.in/courses/106104128
10-14	Advanced concept-Stacks using arrays, Reverse string using stacks, balanced brackets, postfix evaluation, prefix evaluation and infix to postfix conversion, queues using Arrays, Circular queues	https://www.tutorialspoint.com/data_structures_algorithms/stack_program_in_c.htm	https://www.youtube.com/watch?v=VmsTAVpz0x o
15-16	Introduction to basic concepts of object-oriented programming, Procedural Programming versus Object Oriented Programming paradigm, Structures versus Classes, Variables and Data Types in C++, Console I/O, Preprocessor directives	https://www.cet.edu.in/noticefiles/285_OOPS%20lecture%20notes%20Complete.pdf https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/	https://onlinecourses.nptel.ac.in/noc19_cs39/previe w https://www.youtube.com/watch?v=jVJwDy1zUUg https://www.youtube.com/watch?v=LZFoktwiars&list=PL0gIV7t6l2iIsR55zsSgeiOw9Bd_IUTbY
17-18	Decision making (if, if-else, if- else-if ladder, switch case, go to), Repetitive Constructs (for, while, do-while, break, continue)	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=efXI8anQwXo&list=PLEAYkSg4uSQ2qzihjdDEseWrrY1DyxH9 P
19-20	Arrays (1D, 2D, multi dimensional), Understanding pointers, Accessing address of a variable, Declaring & initializing pointers, Accessing a variable through its pointer, Pointer arithmetic, Pointer to a pointer, Accessing arrays using pointer	https://www.hackerearth.com/practice/algorithms/sorting/bubble-sort/visualize/ 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
21-23	Functions in C++ : Inline functions, Default arguments, Function prototyping, Function Overloading	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=PLEAYkSg4uSQ2qzihjdDEseWrrY1DyxH9 P

24-25	Introduction to Pointers in C++, Parameter passing techniques, Pointer Arithmetic in C++, Pointer Arithmetic with Pointers	https://www.w3schools.com/cpp/cpp_pointers.asp	https://www.youtube.com/watch?v=cVLw5HeL3JM
26-28	Dynamic memory management & Pointers - new and delete Operators, 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
29-31	Recursion in C++: Recap of Recursion, Recursion Examples, Order of Execution	https://www.w3schools.com/cpp/cpp_functions_recursion.asp	https://www.youtube.com/watch?v=yVdKa8dnKiE&list=PLgUwDviBIf0rGlzIn_7rsaR2FQ5e6ZOL9
32-34	Direct & Indirect Recursion Stack Overflow, Tail & Non-tail Recursion	https://www.w3schools.com/cpp/cpp_functions_recursion.asp	https://www.youtube.com/watch?v=yVdKa8dnKiE&list=PLgUwDviBIf0rGlzIn_7rsaR2FQ5e6ZOL9
35-38	Classes and Objects: OOps Paradigm and its features, Specifying a class, Creating class objects, Accessing class members.	https://www.cse.iitb.ac.in/~cs101/2019.1/lectures/Lecture20.pdf	https://www.youtube.com/watch?v=i_5pvt7ag7E
39-44	Access specifiers – public,private,and protected, 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 and 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
45-48	Constructors and Destructors: Need for constructors and destructors, , Constructor overloading, Copy constructor, Dynamic constructors, 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
49-54	Operator Overloading: Defining operator overloading, Rules for overloading operators, Overloading of unary operators, Binary operators(+,-,/,*), Binary operators using friend functions, Manipulation of strings using operators Overloading(>,<,==) , 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
55-58	Inheritance: Introduction, Defining derived classes, Forms of Inheritance(single, multilevel, multiple)	https://www.w3schools.in/cplusplus-tutorial/inheritance/	https://www.youtube.com/watch?v=jflvIa60EAg

59-63	Hybrid & hierarchical inheritance, ambiguity in multiple and multipath inheritance	https://www.w3schools.in/cplusplus-tutorial/inheritance/	https://www.youtube.com/watch?v=jflvIa60EAg
64-66	Inheritance with constructor, Overriding member functions, Order of execution of constructors and destructors.	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
67-70	Virtual base class, Overriding member functions	https://www.w3schools.in/cplusplus-tutorial/polymorphism/	https://www.youtube.com/watch?v=jflvIa60EAg
71-75	Concept of Binding - Early binding and late binding, Virtual functions, Pure virtual functions, Abstract classes	https://www.w3schools.in/cplusplus-tutorial/polymorphism/	https://www.youtube.com/watch?v=jflvIa60EAg
76-79	Virtual destructors & polymorphism	https://www.geeksforgeeks.org/virtual-destructor/	https://www.youtube.com/watch?v=DJS9eSN4jAc
80-84	Exception Handling: 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
85-87	Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing an exception, Specifying exceptions.	https://www.coursehero.com/file/129688644/Lecture-9-Exception-handlingppt/	https://www.youtube.com/watch?v=-frZ8btNBSU
88-90	Function templates, Class templates, Overloading of template functions.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/MIT6_096IAP11_lec09.pdf https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/MIT6_096IAP11_lec09.pdf	https://www.youtube.com/watch?v=zjXso3X2jms https://www.youtube.com/watch?v=zjXso3X2jms
91-93	Introduction to the Standard Template Library (Containers, Algorithms, Iterators) : Sequence Container: vector(push_back(),pop_back(),back(),size(),empty()), list(push_front(),pop_front(),front(),size(),empty()) dequeue(push_back(),pop_back(),push_front(),pop_front(),size(),empty())	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
94-97	Associative Container: set(Insert(),erase(),Size(),Empty(),Count(),Clear()), multiset(Insert(),erase(),Size(),Empty(),Count(),Clear()), map(Insert(),erase(),Size(),Empty(),Count(),Clear()), multimap(Insert(),erase(),Size(),Empty(),Count(),Clear())	https://www.geeksforgeeks.org/cpp-stl-tutorial/	https://www.youtube.com/watch?v=W7uB9-TKfTg

98-100	Derived Container: stack, queue, priority_queue, ALGORITHMS: count(),count_if(),find(),find_if(),copy(),fill(),remove(), remove_copy(), replace(), replace_copy(),reverse(),reverse_copy(), unique(),unique_copy(),max(), max_element(), min(),min_element(), iterators: input, output, forward, vectors:back(),begin(),clear(),empty(),end(), erase(),pop_back(),push_back()	https://www.geeksforgeeks.org/cpp-stl-tutorial/	https://www.youtube.com/watch?v=W7uB9-TKfTg