ST. ALOYSIUS COLLEGE (AUTONOMOUS), JABALPUR

PART A: Introduction

Program: **Certificate**	Class: **B.Sc**	Year: **I (sem 2)**	Session: **2022-23**

Subject: **Computer Science**

1.	Course Code	
2.	Course Title	**Programming using C++ and Data Structure**
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational	**Major/Minor**
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.
5.	Course Learning Outcomes(CLO)	**After the completion of this course, a successful student will be able to do the following**: 1. Develop simple algorithms and flow charts to solve a problem with programming using top down design principles. 2. Writing efficient and well-structured computer algorithms/programs. 3. Learn to formulate iterative solutions and array processing algorithms for problems. 4. Use recursive techniques, pointers and searching methods in programming. 5. Will be familiar with fundamental data structures, their implementation; become accustomed to the description of algorithms in both functional and procedural styles. 6. Have knowledge of complexity of basic operations like insert, delete, search on these data structures. 7. Possess ability to choose a data structure to suitably model any data used in computer applications. 8. Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc. 9. Assess efficiency tradeoffs among different data structure implementations. 10. Implement and know the applications of algorithms for searching and sorting.
6.	Credit Value	**Theory – 4 Credits Practical – 2 Credits**
7.	Total Marks	Max. Marks : 40+**60** / Min. Passing Marks: **35**

PART B: Content of the Course

No. of Lectures (in hours per week): **4 Hrs. per week**		
Total No. of Lectures: **60.**		
Module	**Topics**	**No. of Lectures**
I	**Basics of OOPs:** Features and Characteristics of OOPs, History of C++, Application of C++, Data Types, Operator in C++, C++ Stream Classes, Unformatted and Formatted I/O Operation, Managing Output with Manipulators, Scope Resolution Operator	12
II	**Functions In C++:** The Main Function, Function Prototyping, Call by Reference Call by Address, Call by Value, Return by Reference, Inline Function, Default Arguments, Constant Arguments, Function Overloading, **Classes & Objects:** A Sample C++ Program with class, Defining Member Functions (Private & Public), Static Data Members, Static Member, Functions, Array of Objects, Object as Function Arguments, Friend Functions.	12
III	**Arrays:** Representation of single, two-dimensional arrays **Constructor & Destructor:** Constructor, Constructors with Default Arguments, Parameterized Constructor, Copy Constructor, Multiple Constructors in a Class, Destructor. **Searching**(linear & binary) and **sorting** (bubble sort, selection sort & insertion sorting)	12
IV	**Inheritance:** Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Hierarchical Inheritance, Multiple Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Operator Overloading. **Polymorphism:** Virtual functions. **Pointers, Exception Handling**	12
V	**Data Structure:** Basic concepts, Linear and Non-Linear data structures **Stacks:** Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, Infix to Prefix Conversion, Postfix Expression Evaluation. **Queues:** Definition, Operations, Array and Linked Implementations. Circular Queue-Insertion and Deletion Operations, Dequeue (Double Ended Queue), Priority Queue- Implementation. **Linked Lists:** Singly Linked Lists, Operations, Circularly linked lists- Operations Doubly Linked Lists- Operations, Doubly Circular Linked List.	12

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Textbooks:

- J. R. Hanly and E. B. Koffman, “Problem Solving and Program Design in C”, Pearson, 2015
- E. Balguruswamy, "C++ ", TMH Publication ISBN O-07-462038-X
- Herbert Shildt, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7

Reference Books:

- R. Lafore, 'Object Oriented Programming C++"
- N. Dale and C. Weems, “Programming and problem solving with C++: brief edition”, Jones & Bartlett Learning.
- Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
- Sartaj Sahani, “Data Structures, Algorithms and Applications with C++”, McGraw Hill.
- Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
- D.S. Malik, “Data Structure using C++”, Second edition, Cengage Learning.
- M. A. Weiss, “Data structures and Algorithm Analysis in C”, 2nd edition, Pearson.
- Lipschutz, “Schaum’s outline series Data structures”, Tata McGraw-Hill

Suggestive digital platform web links

https://www.youtube.com/watch?v=BClS40yzssA

https://www.youtube.com/watch?v=vLnPwxZdW4Y&vl=en

https://www.youtube.com/watch?v=Umm1ZQ5ltZw

Suggested equivalent online courses

S.No.	Online Course	Duration	Platform
1	Programming in C++ https://nptel.ac.in/courses/106/105/106105151/	8 weeks	NPTEL
2	Beginning C++ Programming - From Beginner to Beyond https://www.udemy.com/course/beginning-c-plus-plus-programming/	Self paced	Udemy

PART D: Assessment and Evaluation

Internal Assessment : Continuous Comprehensive Evaluation (CCE) : 40 **Marks** Three test will be taken of which best of two marks will be considered	**External Assessment**: University Exam (UE) : 60 **Marks** Time : **02.00 Hours**

<table>
<tr><td>Objective type Text I</td><td>20 Marks</td><td>Section (A) : Very short questions (1 from each unit)</td><td>1 x 5 = 5 Marks</td></tr>
<tr><td>Class Test II (Subjective)</td><td>20 Marks</td><td rowspan="2">Section (B) : 5 Short Questions (200 Words Each)</td><td rowspan="2">4 x 5 = 20 Marks</td></tr>
<tr><td>Class Test III (Subjective)</td><td rowspan="2">20 Marks</td></tr>
<tr><td></td><td>Section (C): 5 Long Questions (500 Words Each)</td><td>7 x 5 = 35 Marks</td></tr>
<tr><td>Total</td><td>40 Marks</td><td>Total</td><td>60 Marks</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Any remarks/suggestions: Focus of the course/teaching should be on developing ability of the student in analyzing a problem, building the logic and efficient code for the problem.</td></tr>
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Subject: **Computer Science**				
1.	Course Code			
2.	Course Title	**Programming using C++ Lab**		
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational	**Core Course**		
4.	Pre-Requisite (if any)	To study this course, a student must have basic logical and analytical skills.		
5.	Course Learning Outcomes(CLO)	**After the completion of this course, a successful student will be able to do the following**: 1. Develop simple algorithms and flow charts to solve a problem with programming using top down design principles. 2. Writing efficient and well-structured computer algorithms/programs. 3. Learn to formulate iterative solutions and array processing algorithms for problems. 4. Use recursive techniques, pointers and searching methods in programming. 5. Possess ability to choose a data structure to suitably model any data used in computer applications. 6. Implement and know the applications of algorithms for searching and sorting etc.		
6.	Credit Value	**Practical – 2 Credits**		
7.	Total Marks	Max. Marks : 40+**60**	Min. Passing Marks: **35**	

PART B: Content of the Course		
No. of Lab Practicals (in hours per week): **2 hours per week**		
Total No. of Lab.: **15 (30 hrs)**		
	Suggestive list of Practicals	**No. of Labs.**
	Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code in C++, execute and test it. Students should be given assignments on following :	15

	1. Write a program to find area of a circle, rectangle, square using switch case. 2. Write a program to convert decimal (integer) number into equivalent binary number. 3. Write a program to check given string is palindrome or not. 4. Write a program to print digits of entered number in reverse order. 5. Write a program to print sum of two matrices. 6. Write a program whether a given number is prime or not. 7. Write a program to check entered number is Armstrong or not. 8. Write a program to find the area and volume of a rectangular box using constructor. 9. Write a program to implement single inheritance. 10. Write a program to find largest element from an array. 11. Write a program to implement push and pop operations on a stack using array. 12. Write a program to perform insert and delete operations on a queue using array. 13. Write a program for Linear search. 14. Write a program for Binary search. 15. Write a program for Bubble sort. 16. Write a program for Selection sort. 17. Write a program for Insertion sort. 18. Write a program to implement linked list.	

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https://www.youtube.com/watch?v=Umm1ZQ5ltZw

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2	Beginning C++ Programming - From Beginner to Beyond https://www.udemy.com/course/beginning-c-plus-plus-programming/	Self paced	Udemy	

PART D: Assessment and Evaluation

Internal Assessment : Continuous Comprehensive Evaluation (CCE) : 40 **Marks**		**External Assessment**: University Exam (UE) : **60 Marks** Time : **02.00 Hours**	
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Lab Attendance	10 Marks	Practical record file	25 Marks
		Viva voce practical	10 Marks
Internal Viva	10 Marks	Execution	05 Marks
Practical File	20 Marks	Answer script	20 Marks
Total	**40 Marks**	**Total**	**60 Marks**