Sri Sathya Sai College for Women, Bhopal

(An Autonomous College affiliated to Barkatullah University, Bhopal)

(NAAC Accredited 'A' Grade)

SYLLABUS

SESSION: 2023-24

PROGRAM: Certificate

YEAR: I Year

CLASS: B.Sc.

SUBJECT: Computer Science

Sri Sathya Sai College for Women, Bhopal
(An Autonomous College Affiliated to Barkatullah University Bhopal)
Department of Higher Education, Govt. of M.P.
Under Graduate Syllabus (Annual Pattern)
As recommended by Central Board of Studies and approved by the Governor of M. P.
wef 2021-2022
(Session 2023-24)
(NEP-2020)

Class	**B.Sc.**
Year	**I Year**
Subject	**Computer Science**
Course Title	**Programming Methodology & Data Structures**
Course Type	**Core Course (Major II)/Minor/Elective**
Credit Value	**4**
Max. Mark	**30+70 (Minimum Marks 35)**

Course Outcome: After the completion of this course, a student shall be able to:

- Develop simple algorithms and flow charts to solve a problem with programming using top down design principles.
- Writing efficient and well-structured computer algorithms/programs.
- Learn to formulate iterative solutions and array processing algorithms for problems.
- Use recursive techniques, pointers and searching methods in programming.
- Will be familiar with fundamental data structures, their implementation; become accustomed to the description of algorithms in both functional and procedural styles.
- Have knowledge of complexity of basic operations like insert, delete, search on these data structures.
- Possess ability to choose a data structure to suitably model any data used in computer applications.
- Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.
- Assess efficiency tradeoffs among different data structure implementations.
- Implement and know the applications of algorithms for searching and sorting.
- Know the contributions of Indians in the field of programming and data structures.

Particular

Unit I	**Introduction to Programming** - Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Design, Flowcharts, Types of Programming Methodologies. **Introduction to C++ Programming:** Basic Program Structure in C++, Data Types, Variables, Constants, Operators and Basic I/O. **Variables:** Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar etc.), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h etc.) **Simple Expressions in C++** (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions **Conditional Statements** if construct, switch-case construct.

Unit II	**Iterative Statements** while, do-while, and for loops, Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative) **Functions** Top-Down Design, Pre-defined Functions, Programmer-defined Functions, Local Variables and Global variables, Functions with Default Arguments, Call-By-Value and Call-By-Reference Parameters, Recursion. **Introduction to Arrays** - Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays. Arrays in Functions, Multi-Dimensional Arrays.
Unit III	**Structures** - Member Accessing, Pointers to Structures, Structures and Functions, Arrays of Structures. **Unions** - Declaration and Initialization. **Strings** - Reading and Writing Strings, Arrays of Strings, String and Function, Strings and Structure, Standard String Library Functions. **Searching Algorithms** - Linear Search, Binary Search. **File Handling** - Use of files for data input and output, merging and copying files.
Unit IV	**Data Structure** - Basic concepts, Linear and Non-Linear data structures **Algorithm Specification**-Introduction, Recursive algorithms, Data Abstraction, Performance analysis. **Linked List** - Singly Linked Lists, Operations, Concatenating, circularly linked Lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations. **Array** - Representation of single, two dimensional arrays, sparse matrices-array and linked representations. **Stack** - Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion Implementation.
Unit V	**Queue**- Definition, Operations, Array and Linked Implementations. Circular Queue-Insertion and Deletion Operations, Dequeue (Double Ended Queue), Priority Queue-Implementation. **Trees**- Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees. **Heap**- Definition, Insertion, Deletion.
Unit VI	**Graphs** - Graph ADT, Graph Representations, Graph Traversals, Searching. **Hashing**- Introduction, Hash tables, Hash functions, Overflow Handling. **Sorting Methods**, Comparison of Sorting Methods, **Search Trees** - Binary Search Trees, AVL Trees- Definition and Examples.
Unit VII	**Indian Contribution to the field :** Innovations in India, origin of Julia Programming Language, Indian Engineers who designed new programming languages, open source languages, Dr. Sartaj Sahni – computer scientist - pioneer of data structures, Other relevant contributors and contributions.
Keywords/Tags:	Programming, C++, Data Structures, Expressions, Control, File Handling, Arrays, Stack, Queue, Linked List, Tree, Graph, Structure, Union, Hash, Search, Sort, Algorithm.

Suggestion Books:

- Lipschutz: Schaum's outline series Data structures, Tata McGraw-Hill
- Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson, 2015
- E. Balaguruswamy, "C++ " TMH Publication ISBN O-07-462038-X
- Herbertz Shield, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7
- 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.

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
- https://www.youtube.com/watch?v=AT14lCXuMKI&list=PLdo5W4Nhv31bbKJzrsKfMpo_grxuLl8LU

Suggested equivalent online courses

- https://nptel.ac.in/courses/106/105/106105151/
- https://nptel.ac.in/courses/106/106/106106133/

Scheme of Marks:

Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 30 marks, Term End Exam Theory: 70 marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE):	Class Test Assignment/ Presentation	**30**
External Assessment: University Exam Section Time:03.00 Hours	**Section (A)** Very Short questions **Section (B)** Short questions **Section (C)** Long questions	**70**
		Total 100

Sri Sathya Sai College for Women, Bhopal
(An Autonomous College Affiliated to Barkatullah University Bhopal)
Department of Higher Education, Govt. of M.P.
Under Graduate Syllabus (Annual Pattern)
As recommended by Central Board of Studies and approved by the Governor of M. P.
wef 2021-2022
(Session 2023-24)
(NEP-2020)

Class	**B.Sc.**
Year	**I Year**
Subject	**Computer Science**
Course Title	**Office Tools & Programming Methodology Lab**
Course Type	**Core Course (Major II)**
Credit Value	**2**
Max. Mark	**30+70 (Minimum Marks 35)**

Course Outcome: After the completion of this course, a student shall be able to do the following:

- Develop simple algorithms and flow charts to solve a problem with programming using top down design principles.
- Writing efficient and well-structured computer algorithms/programs.
- Learn to formulate iterative solutions and array processing algorithms for problems.
- Use recursive techniques, pointers and searching methods in programming.
- Possess ability to choose a data structure to suitably model any data used in computer applications.
- Implementation of algorithms for searching and sorting.

Particular

List of Practicals:

I. Office Tools

a. Using a Text Editor Tool

1. Create a document and apply different Editing options.
2. Create Banner for your college.
3. Design a Greeting Card using Word Art for different festivals.
4. Design your Bio data and use page borders and shading.
5. Create a document and insert header and footer, page title, date, time, apply various page formatting features etc.
6. Implement Mail Merge.
7. Insert a table into a document and try different formatting options for the table.

b. Using a Spreadsheet Tool

1. Design your class Time Table.
2. Prepare a Mark Sheet of your class result.
3. Prepare a Salary Slip of an employee of an organization.
4. Prepare a bar chart & pie chart for analysis of Election Results.
5. Prepare a generic Bill of a Super Market.

6. Work on the following exercises on a Workbook:
    a. Copy an existing Sheet
    b. Rename the old Sheet
    c. Insert a new Sheet into an existing Workbook
    d. Delete the renamed Sheet.
7. Prepare an Attendance sheet of 10 students for any 6 subjects of your syllabus. Calculate their total attendance, total percentage of attendance of each student & average of attendance.
8. Create a worksheet of Students list of any 4 faculties and perform following database functions on it.
    a. Sort data by Name
    b. Filter data by Class
    c. Subtotal of no. of students by Class.

c. Using a Presentation Tool

1. Design a presentation of your institute using auto content wizard, design template and blank presentation.
2. Design a presentation illustrating insertion of pictures, Word Art and ClipArt.
3. Design a presentation, learn how to save it in different formats, copying and opening an existing presentation.
4. Design a presentation illustrating insertion of movie, animation and sound.
5. Illustrate use of custom animation and slide transition (using different effects).
6. Design a presentation using charts and tables of the marks obtained in class.

II. **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:**

1. a. To learn elementary techniques involving arithmetic operators and mathematical expressions, appropriate use of selection (if, switch, conditional operators) and control structures
   b. Learn how to use functions and parameter passing in functions, writing recursive programs.

2. Write a program to swap the contents of two variables.
3. Write a program for finding the roots of a Quadratic Equation.
4. Write a program to find area of a circle, rectangle, square using switch case.
5. Write a program to check whether a given number is even or odd.
6. Write a program to print table of any number.
7. Write a program to print Fibonacci series.
8. Write a program to find factorial of a given number.
9. Write a program to convert decimal (integer) number into equivalent binary number.
10. Write a program to check given string is palindrome or not.
11. Write a program to perform multiplications of two matrices.
12. Write a program to print digits of entered number in reverse order.
13. Write a program to print sum of two matrices.
14. Write a program to print multiplication of two matrices.
15. Write a program to generate even/odd series from 1 to 100.
16. Write a program whether a given number is prime or not.

17. Write a program for call by value and call by reference.
18. Write a program to generate a series 1+1/1!+2/2!+3/3!+----------+n/n!
19. Write a program to create a pyramid structure

    *

    **

    ***

    ****
20. Write a program to create a pyramid structure

    1

    12

    123

    1234
21. Write a program to check entered number is Armstrong or not.
22. Write a program for traversing an Array.
23. Write a program to input N numbers, add them and find average.
24. Write a program to find largest element from an array.
25. Write a program for Linear search.
26. Write a program for Binary search.
27. Write a program for Bubble sort.
28. Write a program for Selection sort.

Suggestion Books:

- Lipschutz: Schaum's outline series Data structures, Tata McGraw-Hill
- Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson, 2015
- E. Balaguruswamy, "C++ " TMH Publication ISBN O-07-462038-X
- Herbertz Shield, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7
- 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.

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
- https://nptel.ac.in/courses/106/106/106106127/

Suggested equivalent online courses

- https://nptel.ac.in/courses/106/105/106105151/
- https://nptel.ac.in/courses/106/105/106105171/
- https://onlinecourses.swayam2.ac.in/cec19_mg35/preview

Scheme of Marks:

Maximum Marks: 100		
Internal Assessment :	Class Interaction / Quiz Attendance Assignments (Charts / Model Seminar / Rural Service / Technology Dissemination / Report of Excursion / Lab Visits / Survey / Industrial visit)	**30**
External Assessment:	Viva Voce on Practical Practical Record File Table Work / Experiments	**70**
		Total 100