National Curriculum and Credit Framework (NCCF)

Syllabus

for

Minor Courses in **Computer Science/Computer Application**

w.e.f. Academic Session 2023-24

Kazi Nazrul University

Asansol, Paschim Bardhaman
West Bengal 713340

Semester- I

Course Name: Introduction to Programming using C
Course Code: BSCCOSMN101/BCAMN101

Course Type: **Minor (Theoretical & Practical)**	Course Details: **MNC-1**		L-T-P: **3 – 0 – 4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35

Course Content:

Theory

UNIT I. Introduction to computers, Evolution, Generation of Computers, Computers Hierarchy, Different components of computer (CPU, ALU, different types of memory etc.), Number System – Binary, Hexa, Octal, BCD System, Introduction to operating environment.

UNIT II. Introduction to Programming, Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Flowcharts, Types of Programming Methodologies, Introduction to C Programming - Basic Program Structure in C, Variables and Assignments, Input and Output, Selection and Repetition Statements.

UNIT III. Top-Down Design, Predefined Functions, Programmer-defined Function, Local Variable, Recursion - Developing Recursive Definition of Simple Problems and their implementation.

UNIT IV. Introduction to Arrays, Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays. Arrays in Functions, Multi-Dimensional Arrays, Searching in Array.

UNIT V. Pointers - Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Call-By-Value and Call-By-Reference Parameters.

UNIT VI. Structures - Member Accessing, Pointers to Structures, Structures and Functions, Arrays of Structures, Unions.

UNIT VII. Strings - Declaration and Initialization, Reading and Writing Strings, Arrays of Strings, String and Function, Strings and Structure, Standard String Library Functions.

UNIT VIII. File Handling – File opening modes, use of files for data input and output. merging and copy files.

Practical

UNIT I. Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code, execute and test it. Students should be given assignments on following:

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.

UNIT II. Students should be given assignments on following:

a) Write Programs to learn the use of strings and string handling operations.

b) Problems which can effectively demonstrate use of Arrays. Structures and Union.

c) Write programs using pointers and functions.

d) Write programs to use files for data input and output.

Internal (CA) Evaluation: Practical Note Book (15 marks), Two experiments (10 marks) – one from each unit, Viva-voce (5 marks)

ESE Evaluation: Two experiments (10 marks) – one from each unit, Viva-voce (10 marks)

References/ Suggested Readings:

1. Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson.
2. C Programming, Karnighan & Ritchie, PHI
3. Programming through C, Richard Johnsonbaugh and Martin Kalin, Pearson Education
4. Programming in C, B.S. Gottfried, Sahaum Series.
5. Programming in ANSI C, E. Balaguruswami, TMH

Semester- II

Course Name: Data Structures and Algorithms

Course Code: BSCCOSMN201/ BCAMN201

Course Type: **Minor (Theoretical & Practical)**	Course Details: **MNC-2**		L-T-P: **3 – 0 – 4**	
Credit: **5**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35

Course Content:

Theory

UNIT I. Basic concepts- Data, Data Structures, ADT, Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction, Performance analysis, Linear and Non Linear data structures.

UNIT II. Singly Linked Lists - Operations, Concatenating, Circularly linked lists - Operations for Circularly linked lists, Doubly Linked Lists - Operations. Polynomial and sparse matrix representation using linked list.

UNIT III. Stack- Definition and Operations, Array and Linked Implementations, Applications - Valid Expression Checking (Parenthesis matching), Reversal of string, Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion Implementation.

UNIT IV. Queue - Definition and Operations, Array and Linked Implementations, Applications, Circular Queues - Insertion and Deletion Operations, Priority Queue- Definition and Implementation, Dequeue (Double Ended Queue) - Introduction.

UNIT V. Searching Methods – Linear and Binary.

UNIT VI. Sorting Methods – Bubble, Insertion, Selection, Shell, Using Divide-Conquer Approach (Quick and Merge sort), Comparison of Sorting Methods.

UNIT VII. Trees, Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees, Binary Search tree - Creation, Insertion, Deletion and Search, AVL tree- Definition, Examples, Insertion and Rotations, B tree, B+ tree, Heap- Definition, Min heap, Max heap, Insertion and Deletion. Priority Queue using Heap.

UNIT VIII. Graphs, Graph ADT, Graph Representations, Graph Traversals and Searching,

Practical

Students are required to write and practically execute programs to solve problem using various data structures. The teacher can suitably device problems which help students experiment using the suitable data structures and operations. Some of the problems are indicated below.

1. Write program that uses functions to perform the following:
   a) Creation of list of elements where the size of the list, elements to be inserted and deleted are dynamically given as input.
   b) Implement the operations, insertion, deletion at a given position in the list and search for an element in the list
   c) To display the elements in forward / reverse order
2. Write recursive programs for Factorial, Fibonacci numbers, Towers of Hanoi etc.
3. Write a program to implement stack (using array and linked list). Write a program that demonstrates the application of stack operations (Eg: infix expression to postfix conversion, postfix evaluation).
4. Write programs to implement queue using array and linked list.
5. Write program that implements linear (using array and linked list) and binary search.
6. Write programs of a) Bubble sort b) Insertion Sort c) Selection Sort d) Quicksort etc.
7. Write a program to create a Binary Search Tree and insertion and deletion of node from the tree. Write recursive and non-recursive routines to traverse a binary tree in preorder, inorder and postorder.

Internal (CA) Evaluation: Practical Note Book (15 marks), Two experiments (10 marks), Viva-voce (5 marks)

ESE Evaluation: Two experiments (10 marks), Viva-voce (10 marks)

References/ Suggested Readings:

1. Fundamentals of Data structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson-Freed, Universities Press.
2. Data structures and Algorithm Analysis in C, 2nd edition, M. A. Weiss, Pearson.
3. Data structures, Lipschutz: Schaum's outline series, Tata McGraw-Hill
4. Data Structure through C in Depth, S.K. Srivastava and Deepali Srivastava, B.P.B Publication.