



Krishna Kanta Handiqui State Open University

Hiranya Chandra Bhuyan School of Science and Technology

Discipline of Computer Science

Programme name: Certificate in Computer Science (CCS)

Total Credits: 20

Minimum Qualification: Class 10+2 passed

Course Structure:

COURSE 1: COMPUTER FUNDAMENTALS AND PC SOFTWARE
COURSE 2: COMPUTER PROGRAMMING USING C
COURSE 3: FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEM
COURSE 4: DIGITAL FLUENCY AND EMERGING TECHNOLOGIES
COURSE 5: PRACTICAL

COURSE 1: COMPUTER FUNDAMENTALS AND PC SOFTWARE

Course Type:	Core
Number of Credits:	4
Total Marks:	100

Course Objective:

- Understand the basic concepts of computer systems and types of computer classification.
- Understand the basic concepts of computer memory and operating systems, and components of computer.
- Develop practical skills in using office productivity tools such as word processors, spreadsheets, presentation software, and database management systems in both proprietary and open-source environments.
- Acquire the ability to create, format, manage, and analyse digital documents, data, and presentations for academic and professional purposes.

Course Outcome:

On completion of this course, the learners will be able to:

- Explain the types of computer systems and their classifications.
- Explain the components and functions of computer systems and operating systems.
- Create and format professional documents, spreadsheets, presentations, and databases using MS Office and LibreOffice tools.
- Apply spreadsheet formulas, data management techniques, charting tools, and database queries to organize and analyse data effectively.

Unit 1: Introduction to Computer

Computer- a Definition; Characteristics of Computer; Generations of Computers; Structural Evolution of Computers; File Structure of Computers; Flynn's Classification of Computer Architecture; Applications of Computer: Advantages of Computer

Unit 2: Basic Features of Computer Classification

Computer Classification based on Operating Principles: Analog Computers, Digital Computers, Hybrid Computers; Computer Classification based on Applications: General Purpose Computers, Special Purpose Computers; Computer Classification based on Size and Capability: Micro Computers, Mini Computers, Mainframe Computers, Super Computers

Unit 3: Basic Components of Computer

Concept of Bit and Byte; Block Diagram of Computer, CPU, ALU, CU; Computer Memory: Primary and Secondary; Input/Output Devices; Buses: Address, Data, Control.

Unit 4: Computer Memory and Storage

Memory Representations; Memory Hierarchy; CPU Registers; Primary Memory: Random Access Memory, Read Only Memory; Secondary Memory; Cache Memory; Virtual Memory

Unit 5: MS Windows Operating System

Introduction to Windows, Components of Windows, Customizing the Desktop, Files and Folders.

Unit 6: LINUX Operating System

Open Source and Free Software, Advantages and Disadvantages of Linux OperatingSystem, Concept of Path, Basic Linux Commands, File Permission, Text Editor vi.

Unit 7: Introduction to LibreOffice

Overview of LibreOffice software suite and its features, Advantages of using LibreOffice as an alternative to proprietary software, Installation and configuration of LibreOffice on different platforms

Unit 8: Getting started with Writer

Launching Writer and creating a new document, Navigating the Writer interface and understanding the different components of the document window, Entering and formatting text, applying font styles, and working with paragraphs, Saving, closing, and opening existing documents in different formats.

Unit 9: Working with templates and styles in Writer

Creating and using document templates for consistent formatting and layout, Creating and modifying paragraph and character styles for consistent text formatting, Managing styles in the Styles and Formatting dialog box.

Unit 10: Formatting documents in Writer

Adding and formatting images, tables, and other objects in a document, Applying advanced

formatting options, such as page borders, columns, and page backgrounds, Using Writer's built-in tools for spell-checking, grammar-checking, and language translation.

Unit 11: Introduction to Calc

Overview of Calc and its features as a spreadsheet program, Launching Calc and creating a new spreadsheet, Navigating the Calc interface and understanding the different components of the worksheet window, Entering and formatting data, applying cell formatting, and working with formulas.

Unit 12: Working with functions and formulas in Calc

Using built-in functions and formulas for common calculations in Calc, Creating custom functions and formulas for complex calculations, Using conditional formatting to highlight data based on certain criteria.

Unit 13: Advanced formatting and charting in Calc

Applying advanced formatting options, such as conditional formatting, data validation, and custom number formats, Creating and modifying charts to visualize data in different ways, Using Calc's built-in tools for filtering, sorting, and analyzing data

Unit 14: Introduction to Impress

Overview of Impress and its features as a presentation program, Launching Impress and creating a new presentation, Navigating the Impress interface and understanding the different components of the slide window, Adding and formatting slides, applying transitions, and customizing presentation settings

Unit 15: Working with multimedia and animations in Impress

Adding images, audio, and video to a presentation, Creating and modifying animations to enhance visual effects, Using Impress's built-in tools for recording and rehearsing presentations

Unit 16: Introduction to Base

Overview of Base and its features as a database management tool, Launching Base and creating a new database, Navigating the Base interface and understanding the different components of the database window, creating tables, forms, queries, and reports using Base's built-in tools

COURSE 2: COMPUTER PROGRAMMING USING C

Course Type:	Core
Number of Credits:	4
Total Marks:	100

Course Objective:

- Understand fundamental programming concepts such as algorithms, flowcharts, and structured program design using C language.
- Develop proficiency in using C language elements including data types, operators, control structures, arrays, strings, and functions to solve computational problems.
- Gain knowledge of advanced programming constructs such as pointers, structures, unions, file handling, storage classes, and preprocessor directives.

- Build logical thinking and problem-solving skills required to design, implement, debug, and test C programs efficiently.

Course Outcome:

On completion of this course, the learners will be able to:

- Design algorithms and flowcharts and translate them into structured C programs using appropriate syntax and programming constructs.
- Apply decision-making statements, loops, arrays, strings, and functions to develop efficient solutions for real-world problems.
- Implement advanced C concepts such as pointers, structures, unions, dynamic memory allocation, file handling, and macros in program development.
- Debug, test, and optimize C programs while demonstrating good programming practices and logical reasoning skills.

Unit 1: Introductory Concepts

Basic definition of Pseudo Code, algorithm, flowchart, program

Unit 2: Elements of C Programming

Characters used in C, Identifiers, Keywords, Tokens, Constants, Variables

Unit 3: Variables and Data types

Basic Data types in C: Integer, Character, Floating point, String; Variable and its declarations; Symbolic Constants

Unit 4: Operators and Expressions

Different types of operators: Arithmetic, Relational and Logical, Assignment, Conditional, Increment and decrement, Bitwise, Comma and other operator (size of, period etc). Precedence and associativity of operators, Expression in C, Type Casting

Unit 5: I/O Functions

Header Files (stdio.h, conio.h etc.), Formatted Input/Output Functions (scanf, printf), Escape Sequences, Unformatted Input/Output Functions (getch, getchar, putchar, gets, puts, getche, clrscr)

Unit 6: Conditional Statements

Decision Control Statements, Conditional Statement- if, if- else, nested if-else, switch-case; break, continue, goto

Unit 7: Loop Control Structures

Concept of Loops, Types of loop: while, do-while, for; nested loops

Unit 8: Storage Class

Storage Class, Automatic, External, Static, Register,

Unit 9: Arrays

Array, Array Declaration, 1-Dimensional array, 2-Dimensional array

Unit 10: Strings

String, String Handling Functions: strlen(), strcmp(), strcpy(), strrev(), strcat(), etc

Unit 11: Functions

Function, Function declaration, Function definition, Function call, Formal and Actual parameter, Recursive function

Unit 12: Pointers

Pointer, Pointer declaration, Passing pointer to a function, Pointer and one-dimensional arrays, Dynamic memory allocation

Unit 13: Structures and Union

Structure Declarations, Definitions, Array of Structure, Pointer to Structure. Union Declaration, Definition, Enumerated Data Types.

Unit 14: File Handling

Concept of File, File Pointer, File Opening in various modes, closing a file, reading and writing on files, Formatted Input/Output, fseek(), ftell(), rewind()

Unit 15: Preprocessor Directives

Preprocessor Directives, Macro, Macros with arguments, #if and #elif directives.

COURSE 3: FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEM

Course Type:	Core
Number of Credits:	4
Total Marks:	100

Course Objective:

- Understand the fundamental concepts of data, file systems, database systems, and different data models used in database design.
- Develop the ability to design relational databases using Entity-Relationship modeling, functional dependencies, and normalization techniques.
- Acquire practical skills in writing SQL queries for data definition, manipulation, retrieval, and constraint enforcement.
- Gain knowledge of database implementation techniques, query processing, optimization, and GUI-based database connectivity tools.

Course Outcome:

On completion of this course, the learners will be able to:

- Differentiate between file processing systems and DBMS, explain database architecture, and describe various data models.
- Design ER diagrams and relational schemas, apply normalization (up to BCNF), and analyze functional dependencies to ensure data integrity.
- Write and execute SQL queries including DDL, DML, joins, subqueries, grouping, constraints, and advanced query operations.
- Implement database connectivity using tools such as phpMyAdmin, demonstrate understanding of query processing concepts, and compare structured and unstructured query languages.

Unit 1: File Structure and Organization

Data and Information, Concept of Field, Key Field; Records and its types, Fixed length records and Variable length records; Files, operation on files, Primary file organization.

Unit 2: Database Management System

Definition of DBMS, File processing system vs. DBMS, Advantages and Disadvantages of DBMS, Database Architecture, Data Independence, Data Dictionary, DBMS Language, Database Administrator.

Unit 3: Data Models

Data Models: Object Based Logical Model, Record Base Logical Model, Relational Model, Network Model, Hierarchical Model.

Unit 4: Entity-Relationship Model

Entity Set, Attribute, Relationship Set, Entity Relationship Diagram (ERD), Extended features of ERD.

Unit 5: Relational Databases

Relational data model; Terms: Relation, Tuple, Attribute, Cardinality, Degree, Domain; Keys: Super Key, Candidate Key, Primary Key, Foreign Key;

Unit 6: Relational Algebra

Operations: Select, Project, Union, Difference, Intersection, Cartesian Product, Natural join.

Unit 7: Database Design

Design of Relational Database, Functional Dependency Diagram, Dependency-preserving property

Unit 8: Normalization of Database

Introduction to Normalization, Anomalies of un-normalized Database, Normalization of Database: 1NF, 2NF, 3 NF, BCNF.

Unit 9: Introduction to SQL

Structured Query Language (SQL), Characteristics of SQL, Advantages of SQL, SQL Data types, Types of SQL commands, DDL, DML, Creating a Database, Creating, Altering, and Deleting Tables, Inserting new data, Updating data (the WHERE Clause, The Logical AND and OR operator), Deleting Data.

Unit 10: Advanced SQL I

The SELECT statement, Filtering results with the WHERE Clause; Logical Operators and Operator Precedence (Using logical operator NOT, BETWEEN, LIKE, IN); Ordering Results with ORDER BY (Joining columns-concatenation); Selecting data from more than one table,

Unit 11: Advanced SQL II

Join, Types of Join, SQL commands: Select... From...Where... Group by Having... Order by..., Tables, , Queries, Sub Queries, Insert, Update and Delete operations, Constraints considers (NOT NULL, UNIQUE, Check Primary key, Foreign key)

Unit 12: System Implementation Techniques

Query processing and optimization- translation between SQL queries and relational algebra;

Unit 13: Unstructured Query Language

Structured vs unstructured data, Features of UnQL, Differences between SQL and UnSQL databases, Applications of UnQL

Unit 14: GUI for Database Connectivity

Need for GUI connectivity, Working with PHPMyAdmin: Installation environment for XAMPP, Accessing phpMyAdmin through web browser

COURSE 4: DIGITAL FLUENCY AND EMERGING TECHNOLOGIES

Course Type:	Core
Number of Credits:	4
Total Marks:	100

Course Objectives:

- Understand the fundamental concepts of e-learning, digital platforms, and online collaboration tools used in modern education and business environments.
- Develop practical skills in using digital tools and services such as Google applications, video conferencing platforms, social media, and e-commerce systems.
- Gain foundational knowledge of emerging technologies including Artificial Intelligence, Data Science, IoT, Cloud Computing, Big Data, and Blockchain.
- Understand digital governance systems and the role of technology in transforming public services, industry, and society (Industry 4.0 and Education 4.0).

Course Outcome:

On completion of this course, the learners will be able to:

- Effectively use e-learning platforms, search engines, Google services, and video conferencing tools for academic and professional purposes.
- Apply digital communication and collaboration tools, including social networking platforms and e-commerce applications, in real-world scenarios.
- Explain the basic concepts, applications, and societal impact of emerging technologies such as AI, Machine Learning, IoT, Cloud Computing, Big Data, and Blockchain.
- Demonstrate awareness of digital governance models and online public service systems, and evaluate their role in promoting digital transformation and inclusive development.

Unit 1: Introduction to eLearning

Definition, Asynchronous/Synchronous Learning, e-learning Platforms: Proprietary and open source, Learning Management System (LMS), MOOCs: definition, various MOOC platforms like SWAYAM, Coursera, Edx, Audacity, FutureLearn etc.

Unit 2: Searching Techniques

Search Engines, Searching Techniques; Google, Bing, Advanced Search Options in Google, Translator: Google, Bing

Unit 3: Working with Google Services I

Working with Gmail, Google Docs: creating and posting; Google Sheets: creating and editing; Google Drive: uploading and sharing of files and folders

Unit 4: Working with Google Services II

Google Forms: Creating and analysis of response; Google Voice Assistant; Google Classroom: Creating classroom, Taking class etc.

Unit 5: E-commerce

Introduction, Types of E-commerce, Applications of E-commerce with examples

Unit 6: Video Conferencing Tools

Introduction, Working with various video conferencing tools like Google Meet, Zoom,

WebX, Microsoft Teams, etc

Unit 7: Working with Social Networks

Introduction, Working with various Social Networking Sites like WhatsApp, Youtube, Telegram, Facebook, X, Instagram etc.

Unit 8: Introduction to Artificial Intelligence and Machine Learning

Definition of Artificial Intelligence (AI); Brief history of AI; Types/Categories of AI; Applications of AI: Healthcare, Agriculture, Education etc.; Machine Learning: definition, Supervised learning, Unsupervised learning; Introduction to Industry 4.0 and applications, Introduction to Education 4.0. and applications;

Unit 9: Introduction to Data Science

Definition, of Data Science; Components of Data Science; Data Scientist: Role and Responsibilities; Tools and Technologies used; Applications of Data Science: Healthcare, Education etc.

Unit 10: Introduction to IoT

Definition, basic concepts of IoT and its applications like Smart Home, Smart vehicles, IoT in Agriculture

Unit 11: Introduction to Cloud Computing

Cloud Computing: Definition; Types of Cloud: Public cloud; Private cloud; Hybrid cloud; Community cloud; Types of Cloud services: Infrastructure as a Service (IaaS), Platform as a Service (IaaS) and Software as a Service (SaaS), Applications of Cloud Computing

Unit 12: Introduction to Big Data

Big Data: Definition, Characteristics, Types of Big Data: Structured, Un-structured, Semi-structured; Apache Hadoop; Big Data Platforms, Applications of Big Data

Unit 13: Introduction to Blockchain Technology

Introduction to Blockchain Technology and its Importance, Evolution of the Blockchain Technology, Elements of a Blockchain, Blockchain Applications

Unit 14: E-Governance and Application

E-Governance Models: (G2B,G2C,C2G,G2G), Challenges to E-Governance, Strategies and tactics for implementation of E-Governance, Applications of E-Governance; Digilicker; ADDAR; PAN card; UPPAR ID; mParivathan; DigiYatra;

COURSE 5: PRACTICAL

Additional content or changes may be incorporated into the practical component as deemed necessary.

Practical Components of: COMPUTER FUNDAMENTALS AND PC SOFTWARE

1. Download and install LibreOffice.
2. LibreOffice Writer: Create formatted document like official letter. Use options like Styles, Templates and Insert: Table, Images, Page borders and Apply: Columns, Spell-check.
3. LibreOffice Calc: Create data sheet and apply: Formulas, Functions and use: conditional formatting, data validation, create charts and analyze data using filters.

4. LibreOffice Impress: Create professional presentation; Apply slide master, Add animations, transitions, Insert multimedia.
5. LibreOffice Base: Create database, Create tables, Define primary key, Create form, Run query, Generate report.

Practical Components of: COMPUTER PROGRAMMING USING C

6. Write programs to: Print "Hello World".
7. Write programs to: Perform arithmetic operations.
8. Write programs to: Swap two numbers (with and without third variable).
9. Write programs to: Convert temperature (Celsius ↔ Fahrenheit).
10. Write programs to: Calculate simple and compound interest
11. Write programs to: Check even or odd number.
12. Write programs to: Find largest of three numbers.
13. Write programs to: Grade calculation using if-else.
14. Write programs to: Menu-driven calculator using switch.
15. Write programs to: Print Fibonacci series.
16. Write programs to: Using Function to calculate factorial.
17. Write programs to: Differentiate between Call by value vs call by reference.
18. Write programs to: Store and access elements in an array
19. Write programs to: Find largest and smallest element in an array
20. Write programs to: Sort array (bubble sort).
21. Write programs to: Search element (linear search).
22. Write programs to: Find length of string (without strlen()), Reverse string, Check palindrome string, Count vowels and consonants, Compare two strings (without strcmp()).
23. Write programs to: Use malloc(), calloc() and free() functions
24. Write programs to: Use structure and unions
25. Write programs to: Create and write to file, Read file contents, Count words in file, Append data to file.

Practical Components of: FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEM

26. Create database and tables using MySQL.
27. Insert records, Update records using WHERE clause, Delete records.
28. Alter and drop tables.
29. Perform SELECT queries with: WHERE, BETWEEN, LIKE, IN, NOT
30. Use ORDER BY.
31. Retrieve data from multiple tables.
32. Perform: Inner Join, Left Join, Right Join
33. Write queries using: GROUP BY, HAVING, Subqueries
34. Apply constraints: NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY
35. Install XAMPP.
36. Start Apache and MySQL services.
37. Access phpMyAdmin.
38. Create database using GUI.

Practical Components of: DIGITAL FLUENCY AND EMERGING TECHNOLOGIES

39. Perform advanced Google searches
40. Create: Google Doc, Google Sheet, Google Form
41. Create and manage a Google Classroom

42. Host a meeting on Google Meet/Zoom.
43. Create professional social media profile.
44. Explore DigiLocker, mParivahan, DigiYatra portal.