1-Year Diploma in C Programming (Basic to Advanced)

Comprehensive Curriculum & Course Syllabus

Course Overview:
Designed for absolute beginners to professional programmers. Focuses on procedural logic, memory management, and data structures.

Duration & Format:
1 Year (2 Semesters / 4 Quarters)
240+ Hours Theory & Practical Lab

Semester 1: Fundamentals & Procedural Programming

Module 1: Introduction to Computers, Algorithms & C Basics (Months 1–2)

- **Computer Fundamentals & Logic:** Flowcharts, pseudocode, algorithms, compilers vs. interpreters.
- **C Programming Foundation:** Structure of a C program, compilation process (`gcc`), headers, `main()`.
- **Data Types & Variables:** `int`, `float`, `char`, `double`, `void`, type modifiers (`signed`, `unsigned`), `const`.
- **Operators & Expressions:** Arithmetic, relational, logical, bitwise, assignment, ternary operator `? :`.
- **Input/Output:** Formatted I/O (`printf`, `scanf`) and unformatted I/O (`getchar`, `putchar`, `gets`, `puts`).

Module 2: Control Structures & Modular Programming (Months 3–4)

- **Decision Making:** `if`, `if-else`, nested `if-else`, `else-if` ladder, and `switch-case` statements.
- **Looping Constructs:** `while`, `do-while`, `for` loops, nested loops, `break`, `continue`, and `goto`.
- **Functions & Storage Classes:** User-defined functions, parameters, local, global, static, register variables.
- **Recursion:** Recursive functions, base cases, memory stack behavior (Factorial, Fibonacci, Tower of Hanoi).

Module 3: Derived Data Types & Memory Fundamentals (Months 5–6)

- **Arrays & Strings:** 1D and multi-dimensional arrays, matrix operations, string handling functions (`strlen`, `strcpy`, `strcat`, `strcmp`).
- **Pointers:** Memory addresses, pointer declaration, arithmetic, pointer to pointer, and arrays with pointers.
- **Semester 1 Project:** Console-based utility application (e.g., Student Grading System or Scientific Calculator).

Semester 2: Advanced C, Data Structures & System Applications

Module 4: Advanced Memory & User-Defined Datatypes (Months 7–8)

- **Dynamic Memory Allocation:** `malloc()`, `calloc()`, `realloc()`, `free()`, memory leaks, dangling pointers.
- **Structures & Unions:** `struct`, nested structures, arrays of structures, pointers to structures, `union`, and `enum`.
- **Pre-processor Directives:** Macros (`#define`), file inclusion (`#include`), and conditional compilation.

Module 5: File Handling & Low-Level Operations (Months 9–10)

- **File Operations:** Opening, closing, reading, writing text/binary files (`fopen`, `fprintf`, `fscanf`, `fread`, `fwrite`).
- **Random Access & Arguments:** `fseek()`, `ftell()`, `rewind()`, error handling, and Command Line Arguments (`argc`, `argv`).

Module 6: Data Structures in C & Capstone Project (Months 11–12)

- **Data Structures:** Singly/doubly linked lists, stacks, and queues using arrays and linked lists.
- **Searching & Sorting:** Linear/binary search, bubble, insertion, selection, and merge sort.
- **Capstone Project:** Complete modular application (e.g., Library Management System, Hospital Records).

Assessment & Certification: Continuous weekly labs, mid-term coding exams, final project defense, and award of the official *Diploma in C Programming* certificate by TUES Techno.