 Complete C Programming & Real-Time Systems Course

Instructor: Sanjeet Prasad
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Duration: 40 Days (1.5–2 hours/day)
Format: Instructor-led, hands-on, project-based learning
Audience: Engineering students, automation professionals, embedded developers, and aspiring C programmers

 C Core Modules (Days 1–38)

Day 1: Introduction & Fundamentals

- History and features of C
- Anatomy of a C program
- Compilation and execution flow
- C standards: K&R, ANSI, C89/C90, C99

Day 2: Data Types & Variable Fundamentals

- Primitive types: int, float, char, double, _Bool (C99)
- Variable declarations and initialization
- Constants: #define, const, volatile

Day 3: Operators & Expressions

- Arithmetic, logical, bitwise, relational, assignment
- Operator precedence and ternary operator

Day 4: Input/Output

- printf(), scanf(), getchar(), putchar()
- Deprecated functions: gets()/puts() and their alternatives

Day 5–6: Control Flow Essentials

- Conditional: if, else, switch-case
- Looping: for, while, do-while
- Flow modifiers: break, continue, goto (cautionary use)

Day 7–8: Functions

- Declarations, definitions, scope
- Parameter passing and return values
- Variadic functions, macros, inline (C99)
- Function pointer introduction

Day 9–11: Arrays & Strings

- 1D & 2D arrays, VLAs (C99)
- Strings and pointer access
- String functions: strlen(), strcpy(), strcmp()

Day 12–14: Pointers

- Declaration, dereferencing, arithmetic
- Advanced: void*, restrict, function pointers

Day 15–16: Structures

- Nested and array-based structs
- Bitfields, typedef, packing, file I/O intro

Day 17–19: Memory Management

- malloc(), calloc(), realloc(), free()
- Common issues: leaks, dangling pointers

Day 20–22: Preprocessor & Compilation

- Macros, includes, conditionals
- Header guards, digraphs/trigraphs

Day 23–24: Type Modifiers & Conversion

- Signed/unsigned, casting with typedef, const correctness

Day 25–27: Advanced Topics

- Command line args: main(int argc, char *argv[])
- time.h, rand(), srand(), formatted timestamps
- Deep dive: function pointers, dynamic string arrays

Day 28–29: Data Structures in C

- Linked lists, stacks, and queues (concepts)

Day 30–31: File Handling

- Text & binary modes: r, rb+, fread(), fprintf()
- File operations and data serialization

Day 32–33: Modular Programming

- Multi-file structure, header/source linkage
- Internal linkage with static, extern

Day 34–36: Debugging & Optimization

- GDB basics, print debugging
- Intro to Valgrind for memory analysis
- Building Makefiles
- Optimization using inline and compiler flags

Day 37–38: Best Practices

- Portability across platforms
- MISRA C (intro), static analysis, review strategies

🔧 **Real-Time C Projects (Days 39–40)**

1. Unit converter
2. Marksheet
3. Word counter tool
4. World clock display

🖇️ **Tools & Environment**

- **Compiler**: GCC / Clang
- **Editor**: VS Code
- **Debugger**: GDB
- **Memory Tools**: Valgrind
- **Build**: Makefiles

📺 **Demo Session Preview**

📞 **Contact & Resources**

- **Instructor**: Sanjeet Prasad
- **Email**: sanjeet8.23@gmail.com

- 🔗 GitHub – Projects & Code
- 🔗 LinkedIn – Professional Profile