Complete Roadmap for C Programming with Project.

-SolitaryHorkos

C Programming Roadmap – Basic Level (Beginners)

🎯 Goals:

✅ Understand the fundamental syntax and structure of C.
✅ Learn about data types, variables, and operators.
✅ Master basic input/output operations.
✅ Grasp control flow concepts.
✅ Develop problem-solving skills using C programming.
✅ Get familiar with debugging basics and error handling.

🔰 Phase 1: Environment Setup

🔹 Install and Set Up Development Tools:

- Install a C compiler (GCC, Clang, etc.).
- Choose an IDE or text editor (VS Code, Code::Blocks, Dev-C++).
- Learn to compile and run programs from the command line.

🔰 Phase 2: Introduction to C Programming

📌 What is C?
🔹 Overview and history of the C programming language.
🔹 Features and real-world applications of C.

📌 Basic Syntax and Structure
🔹 Program structure (main() function, statements, and comments).
🔹 Writing your first “Hello, World!” program.
🔹 Understanding tokens, keywords, and identifiers.

🔰 Phase 3: Data Types, Variables & Operators

📌 Data Types & Variables

🔹 Primitive data types (int, float, double, char, void).

🔹 Constants (#define, const).

🔹 Type modifiers (signed, unsigned, short, long).

📌 Operators in C

🔹 Arithmetic operators (+, -, *, /, %).

🔹 Relational operators (==, !=, <, >, <=, >=).

🔹 Logical operators (&&, ||, !).

🔹 Bitwise operators (&, |, ^, <<, >>).

🔹 Assignment operators (=, +=, -=, etc.).

📌 Expressions and Type Conversion

🔹 Implicit and explicit type casting.

🔰 Phase 4: Input and Output Handling

📌 Basic Input & Output

🔹 Using printf() for formatted output.

🔹 Using scanf() for user input.

🔹 Understanding format specifiers (%d, %f, %c, %s, etc.).

🔰 Phase 5: Control Flow Statements

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📌 Conditional Statements

🔹 if, if-else, else-if statements.

🔹 switch statements.

📌 Loops in C

🔹 for, while, and do-while loops.

🔹 Controlling loops with break and continue.

🔰 Phase 6: Functions & Modular Programming

📌 Understanding Functions

🔹 Function declaration, definition, and calling.

🔹 Return types and parameters.

🔹 Scope of variables (local, global, static).

🔰 Phase 7: Arrays & Strings

📌 Working with Arrays

🔹 1D arrays: Declaration, initialization, and traversal.

🔹 2D arrays: Multi-dimensional arrays and their applications.

📌 String Handling in C

🔹 Character arrays and basic string manipulation.

🔰 Phase 8: Introduction to File I/O (Optional for Beginners)

📌 File Handling Basics

🔹 Opening and closing files (fopen(), fclose()).

🔹 Reading from and writing to files.

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🔰 Phase 9: Debugging & Error Handling

📌 Common Errors and Warnings

🔹 Syntax errors, runtime errors, and logical errors.

📌 Using Debugging Tools

🔹 Introduction to GDB (GNU Debugger).

🔹 Recognizing compile-time and runtime errors.

🏆 Skills to Master by the End of This Phase:

✅ Writing simple programs with correct syntax.

✅ Understanding data types, variables, and operators.

✅ Using conditional statements and loops efficiently.

✅ Defining and using functions properly.

✅ Working with arrays and strings.

✅ Handling basic input and output operations.

✅ Debugging and fixing basic errors.

🎯 PROJECTS:

- **Simple Calculator:** A simple calculator that performs basic arithmetic operations (addition, subtraction, multiplication, division).
- **Number Guessing Game:** Create a game where the program randomly selects a number, and the user must guess it.
- **Even or Odd Checker:** Check if a number is even or odd.

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- **Temperature Converter:** Convert using formulas (e.g., Celsius to Fahrenheit) with user input.
- **Unit Converter:** Convert various units (e.g., kilometers to miles, kilograms to pounds).
- **Age Calculator:** Take input as birth year and calculate the age.
- **Vowel or Consonant Checker:** Check if a character is a vowel or consonant.
- **Simple ATM System:** A program that mimics an ATM withdrawal process.
- **Factorial Calculator:** Calculate the factorial of a number.
- **Multiplication Table Generator:** Print the multiplication table of any number.
- **BMI Calculator:** Calculate Body Mass Index based on height and weight.)
- **Simple To-Do List:** A program to add, view, and delete tasks.
- **Fibonacci Sequence Generator:** Generate the Fibonacci series for a given number of elements.
- **Basic Banking System:** Simulate deposit, withdrawal, and balance check.
- **Student Grade Calculator:** Calculate a student's grade based on marks.
- **Simple Quiz Game:** A text-based quiz that asks multiple-choice questions and calculates a score.
- **Pattern Printer:** Print patterns like pyramids, squares, or diamonds using loops.
- **Hello World Variations:** Experiment with different ways to output text—learn about escape characters and format specifiers.
- **Prime Number Checker:** Program to determine if a number entered by the user is prime.
- **Tic Tac Toe (Two-player):** Develop a simple text-based version of Tic Tac Toe for two players.
- **Simple Interest Calculator:** Calculate simple interest.
- **Basic String Reversal:** reverse a small string.
- **Area and perimeter calculator:** calculate areas and perimeters of basic shapes.

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- **Leap year checker:** check if a given year is a leap year.
- **Simple currency converter:** convert between two different currencies.