Guide2Code - C++ Programming Roadmap

◆ **Phase 1: Beginner Level**

📌 **Topics to Learn:**

1. Introduction to C++ (Installation, Syntax, Compilers)

2. Variables & Data Types (int, float, char, bool, etc.)

3. Operators (arithmetic, relational, logical, bitwise)

4. Control Statements (if-else, switch-case)

5. Loops (for, while, do-while, break, continue)

6. Functions (declaration, definition, recursion, inline functions)

7. Arrays & Strings (1D, 2D arrays, string handling functions)

8. Pointers & Memory Management (new, delete, malloc, calloc)

🚀 **Beginner Project Ideas:**

- 🖥️ **Simple Calculator** – Perform basic arithmetic operations

- 📊 **Student Grade System** – Input marks and display grades

- 🔢 **Number Guessing Game** – User guesses a number, program gives hints

- 🌡️ **Temperature Converter** – Convert Celsius ↔ Fahrenheit

- 📅 **Age Calculator** – Calculate age based on the birth year

- 🏧 **Bank Account System** – Basic deposit and withdrawal operations

◆ **Phase 2: Intermediate Level**

📌 **Topics to Learn:**

1. Object-Oriented Programming (Classes, Objects, Encapsulation, Inheritance, Polymorphism)

2. File Handling (Reading, Writing, Appending Files)

3. Standard Template Library (STL) (Vectors, Lists, Maps, Sets)

4. Dynamic Memory Allocation (new, delete, smart pointers)

5. Exception Handling (try-catch, throw, custom exceptions)

6. Operator Overloading & Function Overloading

7. Recursion & Backtracking

8. Sorting & Searching Algorithms (Bubble, Quick, Merge Sort, Binary Search)

🚀 **Intermediate Project Ideas:**

- 📚 **Library Management System** – Store and manage books

- 📞 **Contact Management System** – Store, edit, delete contacts

- 🏢 **Bank Management System** – Manage user accounts and transactions

- 📝 **To-Do List App** – Task management with file storage

- 🎮 **Tic-Tac-Toe Game** – Console-based interactive game

- 🔍 **Web Scraper** – Extract information using C++ libraries

🔷 **Phase 3: Advanced Level**

📌 **Topics to Learn:**

1. Advanced Data Structures (Linked Lists, Stacks, Queues, Trees, Graphs)

2. Multi-threading & Concurrency (Thread Management, Mutex)

3. Networking in C++ (Sockets, Client-Server Communication)

4. Memory Management & Optimization (Heap, Stack, Smart Pointers)

5. Game Development with C++ (SFML, Unreal Engine, OpenGL)

6. System Programming (OS-level operations, Interprocess Communication)

7. Competitive Programming (Advanced Algorithms, Bit Manipulation)

8. AI & Machine Learning with C++ (OpenCV, TensorFlow C++ API)

🚀 **Advanced Project Ideas:**

- 💬 **Chat Application** – Real-time messaging using sockets

- 🏬 **E-commerce System** – Full-fledged shopping platform

- 📊 **Stock Market Predictor** – Machine Learning-based stock prediction

- 📝 **Text Editor** – Implement features like find, replace, and save

- 📹 **Face Recognition System** – AI-powered facial detection

- 🏠 **IoT-Based Smart Home System** – Home automation using C++