**Learn C++ Programming for Beginners – Free 31-Hour Course**

**Chapter 1: Setting up the tools**

**Tools**

* Installing C++ Compilers on Windows
* Installing VS Code on Windows
* Configuring Visual Studio Code for C++ on Windows
* Installing C++ Compilers on Linux
* Installing Visual Studio Code on Linux
* Configuring Visual Studio Code for C++ on Linux
* Installing C++ Compilers on MacOs
* Installing Visual Studio Code on MacOs
* Configuring Visual Studio Code for C++ on MacOs
* Online Compilers

**Chapter 2: Diving in**

* Your First C++ Program
* Comments
* Errors and Warnings
* Statements and Functions
* Data input and output
* C++ Program Execution Model
* C++ core language Vs Standard library Vs STL

**Chapter 3: Variables and data types**

* Variables and data types Introduction
* Number Systems
* Integer types : Decimals and Integers
* Integer Modifiers
* Fractional Numbers
* Booleans
* Characters And Text
* Auto
* Assignments
* Variables and data types summary

**Chapter 4: Operations on Data**

* Introduction on Data operations
* Basic Operations
* Precedence and Associativity
* Prefix/Postfix Increment & Decrement
* Compound Assignment Operators
* Relational Operators
* Logical Operators
* Output formatting
* Numeric Limits
* Math Functions
* Weird Integral Types
* Data Operations Summary
* Chapter 5: Flow Control
* Flow Control Introduction
* If Statements
* Else If
* Switch
* Ternary Operators
* Flow Control Summary

**Chapter 6: Loops**

* Loops Introduction
* For Loop
* While Loop
* Do While Loop

**Chapter 7: Arrays**

* Introduction to Arrays
* Declaring and using arrays
* Size of an array
* Arrays of characters
* Array Bounds

**Chapter 8: Pointers**

* + Introduction to Pointers
  + Declaring and using pointers
  + Pointer to char
  + Program Memory Map Revisited
  + Dynamic Memory Allocation
  + Dangling Pointers
  + When new Fails
  + Null Pointer Safety
  + Memory Leaks
  + Dynamically allocated arrays

**Chapter 9: References**

* Introduction to References
* Declaring and using references
* Comparing pointers and references
* References and const

**Chapter 10: Character Manipulation and Strings**

* Introduction to Strings
* Character Manipulation
* C-string manipulation
* C-String concatenation and copy
* Introducing std::string
* Declaring and using std::string

**Chapter 11: Functions**

* The One Definition Rule
* First Hand on C++ Functions
* Function Declaration and Function Definitions
* Multiple Files - Compilation Model Revisited
* Pass by value
* Pass by pointer
* Pass by reference

**Chapter 12: Getting Things out of functions**

* Introduction to getting things out of functions
* Input and output parameters
* Returning from functions by value
* Chapter 13: Function Overloading
* Function Overloading Introduction
* Overloading with different parameters

**Chapter 14: Lambda functions**

* Introduction to Lambda Functions
* Declaring and using lambda functions
* Capture lists
* Capture all in context

**Summary**

**Chapter 15: Function Templates**

* Introduction to function templates
* Trying out function templates
* Template type deduction and explicit arguments
* Template parameters by reference
* Template specialization
* Chapter 16: C++20 Concepts Crash course
* Introduction to C++20 Concepts
* Using C++20 Concepts
* Building your own C++20 Concepts
* Zooming in on the requires clause
* Combining C++20 Concepts
* C++20 Concepts and auto
* Chapter 17: Classes
* Introduction to classes
* Your First Class
* C++ Constructors
* Defaulted constructors
* Setters and Getters
* Class Across Multiple Files
* Arrow pointer call notation
* Destructors
* Order of Constructor Destructor Calls
* The this Pointer
* struct
* Size of objects

**Chapter 18: Inheritance**

* Introduction to Inheritance
* First try on Inheritance
* Protected members
* Base class access specifiers : Zooming in
* Base class access specifiers - A demo
* Closing in on Private Inheritance
* Resurrecting Members Back in Context
* Default Constructors with Inheritance
* Custom Constructors with Inheritance
* Copy Constructors with Inheritance
* Inheriting Base Constructors
* Inheritance and Destructors
* Reused Symbols in Inheritance
* Chapter 19: Polymorphism
* Introduction to Polymorphism
* Static Binding with Inheritance
* Dynamic binding with virtual functions
* Size of polymorphic objects and slicing
* Polymorphic objects stored in collections (array)
* Override
* Overloading, overriding and function hiding
* Inheritance and Polymorphism at different levels
* Inheritance and polymorphism with static members
* Final
* Virtual functions with default arguments
* Virtual Destructors
* Dynamic casts
* Polymorphic Functions and Destructors
* Pure virtual functions and abstract classes
* Abstract Classes as Interfaces

[Watch the full course below or on the freeCodeCamp.org YouTube channel (31-hour watch).](https://youtu.be/8jLOx1hD3_o)