CPA: Programming Essentials in C++

Scope and Sequence

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Target Audience

The *CPA: Programming Essentials in C++* curriculum is designed for students who want to learn the fundamentals of programming using the C++ language.

Prerequisites

There are no prerequisites for this course.

Target Certification

The *CPA: Programming Essentials in C++* curriculum helps students prepare for the *CPA – C++ Certified Associate Programmer* certification exam. C++ Certified Associate Programmer (CPA) is a professional certification that measures the ability to accomplish coding tasks related to the basics of programming in the C++ language and the fundamental notions and techniques used in object-oriented programming.

Curriculum Description

This course covers all the basics of programming in the C++ programming language as well as the fundamental concepts and techniques used in object-oriented programming. The course starts with some universal basics, without relying on object concepts, and gradually extends to the advanced issues the student will encounter when using the objective approach.

The course is broken down into 9 modules:

- Module 0: explains the process of installing and using the programming environment.
- Module 1: introduces common computer programming concepts, e.g. integers and variables.
- Module 2: discusses advanced flow control and data aggregates.
- Module 3: introduces the subject of pointers, functions and memory.
- Module 4: examines ways to access various kinds of data.
- Module 5: gives an introduction to the fundamentals of object-oriented programming.
- Module 6: discusses the subject of inheritance.
- Module 7: considers the subject of exceptions.
- Module 8: discusses the subject of operators and enumerated types.

Each student has access to hands-on practice materials, quizzes and assessments to learn how to utilize the skills and knowledge gained on the course and interact with some real-life programming tasks and situations.

Curriculum Objectives

The aim of the course is to familiarize the student with the universal concepts of computer programming, present the syntax, semantics and basic data types of the C++ language, discuss the principles of the object-oriented model and its implementation in the C++ language, and demonstrate the means to resolve typical implementation problems with the help of standard C++ language libraries.

During the course, students will study the following objectives:

- Introduction to compiling and software development,
- Basic scalar data types, operators, flow control, streamed input/output, conversions,
- Declaring, defining and invoking functions, function overloading,
- Data aggregates,
- Strings processing, exceptions handling, dealing with namespaces,
- Object-oriented approach and its vocabulary,

- Dealing with classes and objects, class hierarchy and inheritance,
- Defining overloaded operators, self-defined operators, exceptions,
- Fundamentals of STL.

Course Outline

Learning Module	CPA – C++ Certified Associate Programmer Certification Objectives Covered
0 – Installing and using your programming environment	• introduction to compiling and software development.
1 – Introduction to computer programming	• machine and high-level programming languages, compilation process, • obtaining machine code: compilation process, • writing simple programs, • variables, • integers: values, literals, operators, • characters: values, literals, operators, • dealing with streams and basic input/output operations.
2 – Advanced flow control and data aggregates	• how to control the flow of the program • floating point types: values, literals, operators, • more integer types: values and literals, • loops and controlling loop execution, • logic, bitwise and arithmetic operators, • structures.
3 – Extending expressive power: pointers, functions and memory	• pointers, • pointers vs arrays • functions, • declaring and invoking functions, • side effects, • different methods of passing parameters and their purpose, • default parameters, • inline functions, • overloaded functions, • sorting, • memory on demand.
4 – Accessing different kinds of data	• converting values of different types, • strings: declarations, initializations, assignments, • the string as an example of an object: introducing methods and properties, • namespaces: using and declaring, • dealing with exceptions.
5 – Object programming essentials	• class, • objects, • class components, • constructors, • referring to objects, • static members, • classes and their friends.

6 – Inheritance	• base class, superclass, subclass, • inheritance: how it works, • types of inheritance, • inheriting different class components, • multiple inheritance, • polymorphism: notion and purpose, • virtual methods: declaration and usage, • inheriting virtual methods, • abstraction and abstract classes.
7 – Exceptions	• what is an exception, • catching and throwing exceptions, • different classes exceptions and hierarchies, • defining your own exceptions.
8 – Operators and enumerated types	• defining and overloading operators, • using operators with complex classes, • enumerated types.

Minimum System Requirements

The course content modules, labs, quizzes and assessments can be accessed online through any Internet browser. For the best learning experience, we recommend using the most recent versions of Mozilla Firefox or Internet Explorer/Microsoft Edge.

Industry certification

The course curriculum helps students prepare for the C++ Institute *CPA – C++ Certified Associate Programmer* certification.

A Statement of Achievement will be issued to participants who successfully complete the *CPA: Programming Essentials in C++* course. The Statement of Achievement will acknowledge that the individual has completed the course and is now ready to attempt the qualification *CPA – C++ Certified Associate Programmer Certification*, taken through Pearson VUE computer-based testing, at a 51% discount.

To receive the Statement of Achievement, instructors must mark the student as having successfully passed the course.

For additional information about the *C++ Institute CPA – C++ Certified Associate Programmer certification*, please visit www.cppinstitute.org/certification.