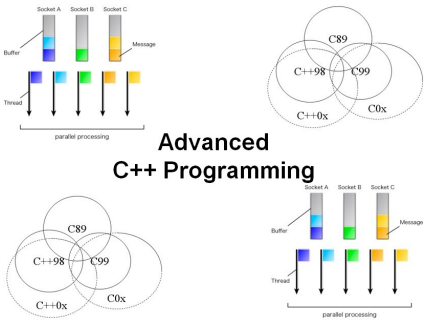
# Advanced C++ Programming

Duration: 4 days Price: € 2450

Open Schedule




### Audience Course Advanced C++ Programming

This course is intended for developers who are familiar with C++ but who want to delve into the more advanced techniques and possibilities of the language.

### Prerequisites Course Advanced C++ Programming

To participate in this course knowledge of the basic concepts of C++ and extensive experience with programming in C++ is required. The participants must be familiar with topics such as operator overloading, templates, virtual functions and polymorphism.

### Realization Training Advanced C++ Programming

The theory is treated on the basis of presentation slides. Illustrative demos clarify the concepts discussed. Theory and practice are interchanged and there is ample opportunity to practice.

### Official Certificate Advanced C++ Programming

Participants receive an official Advanced C++ Programming certificate after successful completion of the course.

## Content Course Advanced C++ Programming

In the course Advanced C++ the new and advanced aspects of the C++ language based on the standards C++11, C++14, C++17 and C++20 are extensively discussed.

### C++11 Features

The course starts with an overview of the features introduced in C++11 such as type inference, initializer lists, range based for loop, lambda functions and strongly typed enums.

### Right References en Move Constructors

Next, the right references and the performance gains that can be achieved by using move constructors in addition to copy constructors are discussed.

### Inheritance Additions

The new possibilities regarding inheritance with the keywords default, delete, override and final are also covered. The implementation of virtual functions and the need for virtual destructors are discussed as well.

### Smart Pointers

In addition, smart pointers are looked at in detail and unique pointers, shared pointers and weak pointers are treated.

### Operator Overloading and Templates

Operator overloading and templates are also on the program, which focuses on variadic templates and perfect forwarding.

### RAII Pattern

The modern C++ Resource Acquisition is Initialization or RAII idiom is discussed with exception handling.

### Multithreading

Threads as well as the synchronization between threads are part of the standard and are discussed. This also includes asynchronous calls with promises and futures.

### C++11, C++17 and C++20 Features

Then specific C++11, C++17 and C++20 features are discussed such as optional types, structured binding declarations and constructions from the world of functional programming such as fold expressions.

### Advanced STL

The course concludes with an overview of advanced options of the Standard Template Library **STL**.

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# Modules Course Advanced C++ Programming

| Module 1 : Modern C++ Features | Module 2 : Move Semantics | Module 3 : Inheritance |
|---|---|---|
| C++11 Features | Reference Initialization | default and delete Keyword |
| Type Inference | References and Pointers | Delegating Constructors |
| Auto Keyword | Rvalues and Rvalues in C++ | Inheritance |
| Deduction with decltype | Passing and Returning References | Calling Base Class Constructors |
| Uniform Initialization | Rvalue References | Multiple Inheritance |
| Initializer Lists | Comparing Reference Types | Virtual Derivation |
| Range Based for Loop | Rvalue Reference Usage | Polymorphism |
| Null Pointer Constant | Assignment Operator | Virtual Functions |
| constexpr Keyword | Copy Constructor | Abstract Classes |
| Static Asserts | Passing and Returning Objects | Interfaces in C++ |
| Lambda Functions | Passing References to Objects | Destructors and Inheritance |
| Strongly Types Enums | Move Constructor | Virtual Destructors |
| User Defined Literals | Move Assignment Operator | override Specifier |
| Raw String Literals | Golden Rule of 5 | final Specifier |
| **Module 4 : Smart Pointers** | **Module 5 : Operator Overloading** | **Module 6 : Templates** |
| unique_ptr | Syntax Operator Overloading | Template Functions |
| Using unique_ptr | Overloading Numeric Types | Template Specialization |
| Specialization for Arrays | Overloading Overview | Template Parameter List |
| Replacement for std::auto_ptr | Overloading Restrictions | Inclusion Compilation Model |
| std::make_unique | When not to Overload | Class Templates |
| shared _ptr Pointer | Operators as Class Members | Template Member Functions |
| Control Block | Operators as Friend Functions | Template Parameter Scope |
| shared_ptr Destruction Policy | Overloading Stream Operators | Templates and Statics |
| shared_ptr Interface | Overloading ostream and istream | Templates and Friends |
| Cyclic References | Overloading Unary Operators | Alias Templates |
| weak_ptr | Overloading Binary Operators | Perfect Forwarding |
| **Module 7 : Exception Handling** | **Module 8 : Multiple Threads** | **Module 9 : Synchronization** |
| Error Conditions and Exceptions | Multiple Threads | Data Corruption |
| Class Objects as Exceptions | Benefits and Drawbacks | Lock Guard |
| Parameter Catch Block | Thread Class | Automatic Lock Management |
| Catching in Hierarchy | Joining Threads | Mutex and RAII |
| Golden Rule | Detaching Threads | Recursive Locking |
| Rethrowing Exceptions | Thread ID | Atomic Types |
| noexcept Specifier | Callables | Call Once |
| Preventing Resource Leaks | Passing Parameters | Event Handling |
| RAII Idiom | Pass by Reference | Condition Variables |
| C++ Standard Exceptions | Pass by std::ref and std::move | Wait and Notify |
| User Defined Exceptions | Member Function as Thread | Promises and Futures |
| Exception Handling Costs | Thread Local Storage | Asynchronous Tasks |
| **Module 10 : C++14-17-20 Features** | **Module 11 : Standard Template Library** | |
| Init-statement for if | STL Core Components | |
| Selection Initialization | Containers, Algorithms and Iterators | |
| Structured Binding Declarations | Vectors, Lists and Dequeues | |
| const if Expressions | Adapters and Associative Containers | |
| Guaranteed Copy Elision | Maps and Hash Maps | |
| Inline Variables | Bitsets | |
| Fold Expressions | STL Iterators | |
| Optional Type | Reverse and Iostream iterators | |
| Small String Allocations | Function objects | |
| String View | STL Algorithms | |
| Generic lambdas | Predicates and Comparators | |
| Aggregate initialization | STL Allocators | |