C++ Programming

ECTS : 3

Description du contenu de l'enseignement :

This practical oriented course focuses on learning C++ language as a practical tool. It aims to be both an introduction to C/C++ and a basic course for whoever want to get an expertise in programming. A special care to practice is taken through solving simple issues C++ as a tool ; no special programming background is expected. The 2 last courses are dedicated to advanced topics, not mandatory to learn the language, but important for people with programming background especially C programmers. A good grasp of the previous lessons will be required.

Course outline:

1. The basics
   - Working with git
   - C++ first program, compilation chaintools, input and output
   - Variables and types, scopes, operators
   - Working with numbers: maths VS computers
   - Control structures
2. Express your algorithms using C++
   - Functions (declaration, arguments, overloading)
   - lvalue and rvalue references
   - Namespace
   - Precompiler and macros
   - Program structure and build process
   - Application: closed-formulae for pricing
3. Programming with the STL
   - Sequential containers
   - Associative containers
   - Algorithms, iterators, functors
   - Lambdas
   - Streams
4. Defining your own types
   - Structures and classes
   - Value semantic
   - Conversions
   - Operator overloading
   - Application: data models in pricing libraries
5. Managing memory and low-level data structures
   - Pointers and arrays
   - Pointer to method and functions
   - Three kinds of memory
   - Exceptions
6. Making your types abstract
   - Inheritance and polymorphism
   - Entity semantic and Liskov Substitution Principle
   - Runtime Type Information
   - Multiple inheritance
   - Inheritance of implementation
   - Application: reusable numerical tools
7. Generic programming: write less, do more
   - Template classes and specializations
   - Template functions, specialization vs overloading
   - Type deduction and auto

- Universal references and perfect forwarding
- Curiously Recurring Template Pattern
- Traits
- Managing the overload resolution set
- Variadic templates and advanced metaprogramming

Compétence à acquérir :

Knowledge in C++ programming for finance

Bibliographie, lectures recommandées :

Beginners:
Stanley B.Lippman, Josee Lajoie, Barbara Moo, "C++ Primer ", Fifth Edition, 2012.
Koenig A. & B. E. Moo, "Accelerated C++", Addison-Wesley, 2000
Reference guides:
Bjarne Stroustrup, "The C++ Programming Language", Fourth Edition, 2013.
Nicolai M. Josuttis N. M., "The C++ standard library" 2nd edition, Addison-Wesley, 2012
Scott Meyers, “Effective STL”, Addison-Wesley, 2001

Online Gurus:
http://www.drdobbs.com/

Document susceptible de mise à jour - 25/02/2026
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