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/

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Université Paris Dauphine - PSL - Place du Maréchal de Lattre de Tassigny - 75775 PARIS Cedex 16