Columbia University
Programming in C++ for Financial Engineering
Ali Hirsa
ah2347@columbia.edu

Course Overview

This course covers features of the C++ programming language which are essential in financial engineering and its applications. We start by covering basic C++ programming features and then move to some more advance features. We utilize these features for financial engineering and quantitative finance applications.

Textbooks:

Recommended textbooks are:

- C++ how to program, 9th Edition by Deitel & Deitel
- The C++ Programming Language, 4th Edition by Bjarne Stroustrup

Required Work and Grading Policy:

- Assignment: 3 case studies (C++ programming)
- In-Class Examination

Grading is based the following weighting schemes:

- 60% Case Studies, 40% In-class Examination

Teaching Assistant:

Helen Chien
e-mail: TBA

Office Hours:

Ali Hirsa on Tuesdays 12:20pm-1:00pm & 3:40pm-4:10pm Room #318

Helen Chien by appointment

Outline (subject to change)
Session 01 – Overview

Session 02 – Basic C++ programming features, structure of a program; variables and types

Session 03 – Input/Output formation; Reading from input data; writing/modifying to output data; binary versus ascii

Session 04 – Arrays vs. pointers; dynamic memory; data structures; function and function pointer

Session 05 – Multi-Dimensional arrays; Writing and compiling a C++ function

Session 06 – Memory management (allocation/de-allocation) of multi-dimensional arrays, memory leak

Session 07 – Control Structures; Overloads and templates; Running modules utilizing LIBs

Session 08 – Setting up matrices and vectors and matrix/vector operations, matrix algebra (sparse vs. dense)

Session 09 – Index manipulation, efficiency in programming, debugging

Session 10 – Creating and using complex numbers, utilizing function with complex input

Session 11 – Encapsulation and Inheritance

Session 12 – Polymorphism (virtual method)

Session 13 – Random Number Generations, Sampling from various different distributions

Session 14 – Gentle introduction to Monte Carlo simulation and simulating paths

Session 15 – Calling/utilizing various optimization routines