

16:332:503 (Fall) COURSE SYLLABUS

Course No: 16:332:503 (Fall)

Course Title: Programming Methodology for Numerical Computing and Computational Finance

Prerequisites: Introductory programming course

Corequisites: none

Type: Required for MS in Mathematical Finance

Date Prepared: May 2008

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Catalog Description: 16:332:579 –Programming Methodology for Numerical Computing and Computational Finance (3)

Prerequisites: any introductory programming course

Course Overview: This course will cover the fundamentals of object oriented programming and C++ with an emphasis in numerical computing and computational finance applications. This is a design oriented course. Topics to be covered include: program structure and C++ syntax (loops, functions, arrays, pointers), object oriented concepts and data structures (abstract data types, classes, overloading, inheritance, linked lists, stacks, queues, trees) with a focus on mathematical functions, numerical methods and quantitative finance applications.

Textbooks:

- *How to Program in C++*, by Deitel & Deitel or the equivalent.

Goals: To develop skills in object oriented programming methodology using C++ with an emphasis in numerical computing and computational financial applications.

General Description: This is a design oriented course that meets in a computer lab/classroom for maximum emphasis on hands-on programming. Lectures will be reinforced with small programming examples during the lecture, followed by homeworks and lab exercises that will focus on numerical computing and computational financial applications. The course is broken up into three major parts: the first part covers the basics of C++ syntax, data types and program structure. The second introduces object oriented programming concepts. The third part of the course covers data structures and advanced program design. All concepts and topics covered will be demonstrated using financial or numerical computing applications. The course will culminate in a final project. The textbook for the

course is “How to Program in C++” by Deitel & Deitel. It is a general guide for C++ and has a supplemental lab manual.

Week-by-Week Syllabus

Week 1: Part I: Overview of C++ basics: syntax, control structures, data types, code compilation

Week 2: C++ basics: loops, functions – call by reference, call by value,

Weeks 3 and 4: C++ basics: arrays, pointers, recursion, mathematical functions

Part II: Week 5: Introduction to classes & object oriented programming

Weeks 6 and 7: Operator overloading & memory management.

Week 8: Inheritance & Polymorphism.

Weeks 9: Advanced Inheritance,

Week 10: Templates & The Standard Template Library

Part III: Weeks 11 & 12: Abstract Data Types: lists, linked list, stack, queues, trees

Week 13 & 14: Data Structures for Financial Engineering Applications

Week 15: Quantitative Finance Application I

Week 16: Review, Final Project & Final Examination

Computer usage: Extensive use of C++ programming.

Laboratory projects: (including major items of equipment and instrumentation used) Yes

Amount of Homework required or suggested per week: 3 hours

ABET category content:

Relationship of Course to Program Objectives:

Relationship of Course to Program Outcomes: