

Western University
Applied Mathematics 3611F
Introduction to Object Oriented Scientific Programming
Course Outline Fall 2016

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Class Times: M W F 8:30 - 9:30 a.m. in MC 17

Office Hours: M W F 9:30 – 10:30 a.m. in MC 250 or by appointment

Prerequisite(s): Calculus 1301A/B, 1501A/B, Applied Mathematics 1201A/B or 1413

Antirequisite(s): The former Applied Mathematics 4611F/G

Textbook: None.

Course Web Site: A set of C++ topics, source codes, and a PDF version of lecture notes will be given on the course website <http://owl.uwo.ca>

Course Description: Basic introduction to C++, review of numerical methods applicable to problems in linear algebra and differential equations, introduction to the concept of object-oriented programming techniques, applications to scientific computation. Grade is based upon assignments / quizzes, two projects and a presentation.

Course Outline by Topical Areas:

- An Overview of Programming Languages
- Object-Oriented Programming and C++
- Basic C++, Fundamental Types and Basic Operators
- Functions, Recursion, Iteration Technique
- Vectors and Arrays, Pointers and References, Dynamic Memory Allocation
- Structures, Classes, Friends, Overloading Operators, Inheritance
- Templates, Standard Library
- Input and Output, Testing and Debugging
- Numerical Integration
- Complex Analysis
- Matrix Computations, System of Linear Equations
- Numerical Methods for Differential Equations
- Optimization
- C# (CSharp) application for the .NET Platform

Projects and Optional:

Computer algebra system, Partial differential equations, Eigensystem, Optimization, Quadratic programming, Portfolio optimization, Statistics, Interface Matlab with C++, Simulating and numerical computing, High precision software, Applications in Physics, Biomedicine, Economics, Financial Modeling, Environmental Science, etc.

Method of Evaluation:

- 5% Assignment 1 – September 30, 2016
- 5% Assignment 2 – October 14 2016
- 20% Programming project 1 - October 28, 2016
- 5% Assignment 3 – November 18, 2016
- 45% Programming project 2 – November 25, 2016
- 10% Presentation – November 30, December 2, 5, 7, 2016
- 10% In Class Portion

In class portion: The in class portion of your grade will be determined by your instructor, and may include points for participation, in class quizzes, etc.

Addendum to all Applied Mathematics Course Outlines:

The UWO Senate Academic Handbook has specified that the following points should be added to all course outlines:

Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar). If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information: <http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>.

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here: https://studentservices.uwo.ca/secure/medical_document.pdf