Applied Mathematics 3611F
Introduction to Object Oriented Scientific Programming
Course outline for Fall 2020

Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the Digital Student Experience website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: https://www.uwo.ca/health/.

1. Technical Requirements:

Stable internet connection

Laptop or computer

Working microphone

Working webcam

2. Course Overview and Important Dates:

Delivery Mode	Dates	Time
In-person	M / W / F	**8:30 AM - 9:30 AM**

*Details about design and delivery of the course are listed below in Section 4

Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
September 9	November 2 - 8	December 9	December 10	December 11 - 22

* November 12, 2020: Last day to drop a first-term half course or a first-term full course without penalty

3. Contact Information

Instructor	Contact Information
Dr. Zinovi Krougly	zkrougly@uwo.ca

Teaching Assistant	

Emails: Any email sent to an instructor MUST say AM 3611F in the subject line.
The email must also be sent from your UWO email account. Any email without this, and/or any email sent from a non-UWO email address, could be blocked by a spam filter or otherwise be deleted unread.

4. Course Description and Design

Class Times: M / W / F 8:30 AM - 9:30 AM in TC 141 or online by Zoom

Office Hours: W 9:30 AM - 10:30 AM in MC 264 or online by Zoom

Required Textbook: None

Course Website: http://owl.uwo.ca

A set of C++ topics, source codes, and lecture notes will be given on the course website http://owl.uwo.ca.

Prerequisite(s): Calculus 1301A/B, Calculus 1501A/B, Applied Mathematics 1201A/B or Applied Mathematics 1413. **Pre-or Corequisite(s):** Applied Mathematics 2402A, or Applied Mathematics 2811B, or Applied Mathematics 2814F/G, or Statistical Sciences 2857A/B.

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

All course material will be posted to OWL: http://owl.uwo.ca. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click here.

5. Learning Outcomes

General learning objectives:

- 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

Specific learning objectives:

- Numerically Finding Roots and Optimization
- Numerical Integration
- Complex Analysis
- Matrix Computations, System of Linear Equations
- Numerical Methods for Differential Equations
- C# (CSharp) application for the .NET Platform

6. Course Content and Schedule

Week	Dates	Topics	Comments
1	Sept 9 – 13	Basic C++ Definitions	Presentation of the course
2	Sept 14 – 20	Sample Program	
3	Sept 21 – 27	C++ Expressions	
4	Sept 28 – Oct 4	Functions and Header Files	Assignment 1 (September 30)
5	Oct 5 – 11	Control and Iterative Statements	
6	Oct 12 – 18	Numerical Procedure, Roots and Optimization	Assignment 2 (October 14)
7	Oct 19 – 25	Arrays, Memory and Pointers, Inputs and Outputs	
8	Oct 26 – Nov 1	Numerical Integration, Classes, Testing and Debugging	Programming project 1 (October 28
9	Nov 2 – 8	Reading Week	No classes
10	Nov 9 – 15	Complex Number Class	Nov. 12, last day to drop a first-term half course without penalty.
11	Nov 16 – 22	Ordinary Differential Equations, Simulations	Assignment 3 (November 18)
12	Nov 23 – 29	Class Vectors and Matrices, Matrix Computations	
13	Nov 30 – Dec 6	Templates, Standard Libraries	Final project (December 4)
14	Dec 7 – 9	Final Project Presentations	Wed. Dec. 9, 2020, Classes end

7. Online Participation and Engagement

☒ Students are expected to participate and engage with content as much as possible
☒ Lectures are delivered asynchronously

8. Evaluation

Below is the tentative evaluation breakdown for the course. Any deviations will be communicated.

Assessment	Format	Weighting	Date
Assignment 1	In-person and online	5%	September 30
Assignment 2	In-person and online	5%	October 14
Programming Project 1	In-person and online	20%	October 28
Assignment 3	In-person and online	5%	November 18
Final Programming Project	In-person and online	45%	December 4
Presentation of Final Project	In-person and online	10%	December 7 - 9
Class Portion	In-person and online	10%	N/A

In class portion:

Will be determined by instructor, and may include in class quizzes, points for participation, etc.

9. ***Optional Reading and References:***

1. Introducing C++ for Scientists, Engineers and Mathematicians, by D. Capper, 2nd edition, Springer, 2001.
2. C++ for Engineers and Scientists, by G. J. Bronson, Cengage Learning, 2012.
3. Joyce Farrell, Object-Oriented Programming Using C++, Fourth Edition. Course Technology, 2009.
4. Engineering Problem Solving with C++, 2nd ed., by D. Etter and J. Ingber, Pearson, 2008.
5. Essential C++ for Engineers and Scientists, by J. Hanly, Addison Wesley, 1997.
6. C++ for everyone, by C. Horstmann, Wiley, 2009.
7. Problem Solving with C++, by W. Savitch, 8th ed., Addison Wesley, 2012.
8. C++ and Object Oriented Numeric Computing for Scientists and Engineers, by D. Yang, 2001.
9. Programming in C++ for Engineering and Science by Larry Nyhoff, CRC Press, 2012.
10. Guide to Scientific Computing in C++, by Joe Pitt-Francis and Jonathan Whiteley, 2012, available online for free through UWO library.

10. Professionalism & Privacy:

Western students are expected to follow the Student Code of Conduct. Additionally, the following expectations and professional conduct apply to this course:

☒ Students are expected to follow online etiquette expectations provided on OWL
☒ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared
☒ Recordings are not permitted (audio or video) without explicit permission
☒ Permitted recordings are not to be distributed
☒ Students will be expected to take an academic integrity pledge before some assessments
☒ All recorded sessions will remain within the course site or unlisted if streamed

11. How to Be Successful in this Class:

Students are responsible for learning the material presented in lectures, and for demonstrating that learning on programming projects, assignments and quizzes.

1. For each hour of lecture, an average student should spend about 2 hours studying the material at home. This includes reading the relevant course material, analyzing programming codes, doing assignments and scientific programming projects. This course covers a lot of material, and is cumulative, so it will be necessary to work regularly throughout the term to do well.

2. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.

3. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.

4. Do not be afraid to ask questions. If you are struggling with a topic, contact your instructor.

12. Western Academic Policies and Statements

Absence from Course Commitments

Policy on Academic Consideration for Student Absences
In the interest of the health and safety of students and health care providers, you are no longer required to seek a medical note for absences this term. If you are unable to meet a course requirement due to illness you should use the Illness Reporting Tool. This tool takes the place of the need to submit a medical note and the Self-Reported Absence System formally used by undergraduate students.

Contingency plan for an in-person class pivoting to 100% online learning

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

Accommodation for Religious Holidays

The policy on Accommodation for Religious Holidays can be viewed here.

Special Examinations

A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents. To provide an opportunity for students to recover from the circumstances resulting in a Special Examination, the University has implemented Special Examinations dates. These dates as well as other important information about examinations and academic standing can be found here.

Academic Offenses

"Scholastic offences are taken seriously, and students are directed here to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Accessible Education (AE) at 661-2111 x 82147 for any specific question regarding an accommodation or review The policy on Accommodation for Students with Disabilities.

Correspondence Statement

The email account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that email received from the University at his/her official university address is attended to in a timely manner. You can read about the privacy and security of the UWO email accounts here.

13. Academic Policies and Statements

Copyright and Audio/Video Recording Statement

Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. You must always ask permission to record another individual and you should never share or distribute recordings.

14. Support Services

The following links provide information about support services at Western University.

Academic Counselling (Science and Basic Medical Sciences)

Appeal Procedures

Registrarial Services

Student Development Services

Student Health Services