

COURSE OUTLINE (SYLLABUS) for AM4615 – Introduction to Applied Computer Algebra

1. General Course Information

Course Information

Title: AM4615 Introduction to Applied Computer Algebra, Fall/Winter term

Scheduled Time and Location:

Tuesday 1:30-3:30 Middlesex College 204.

Thursday 1:30-3:30 Social Science Centre 1032 (This is a computer “Genlab”).

List of Prerequisites

AM 2814 (Numerical analysis). Equivalent experience in computation can be accepted on consultation with instructor. The course will assume a knowledge of calculus and linear algebra. Experience with a programming language will be an advantage.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Professor David J. Jeffrey,

Office: Middlesex College 255,

Email: djeffrey@uwo.ca

Students must use their Western (@uwo.ca) email addresses when contacting their instructors.

3. Course Description/Syllabus

This course will cover practical symbolic computations using Maple. Topics in applied mathematics and engineering will be used as the basis of practical training in symbolic computation. Also, selected topics in the basic algorithms of computer algebra will be covered. The course is classified as an essay course, and therefore students will be expected to prepare a short project in computer algebra and present a written report.

Topics selected from the following:

- Maple interfaces: their advantages and disadvantages.
- Basic algebraic manipulation: expanding, factoring, solving equations, assigning variables, simplifying expressions. Defining expressions and functions.
- Maple libraries: existence of libraries and modules. Basic Maple architecture; loading of libraries.
- Calculus with Maple: differentiation, integration, series, limits.
- Plotting in Maple: 2-D, 3-D plotting. Animation.

- Numerical computation in Maple: exact computation and approximate computation. Variable floating-point precision. Hardware floats and software floats.
- Linear Algebra with Maple: Entering matrices and vectors and arrays. Solving all standard problems in linear algebra.
- Differential equations: Solving ODEs in Maple.
- Complex numbers and functions: working with complex functions.
- Systems of polynomial equations: analysing and solving systems using resultants, Gröbner bases and regular chains systems.
- Algorithms: Euclidean algorithm; Homomorphisms.

Learning outcomes for AM4615: Introduction to Applied Computer Algebra

- PLO 2: Use Maple interactively.
- PLO 2: Write functions (programs) in the Maple programming language.
- PLO 2: Debug Maple functions by tracing their execution.
- PLO 1: Solve problems taken from other Applied Mathematics courses, such as Calculus, Differential equations, Linear algebra using Maple.
- PLO 4: Understand the differences between numerical computation with fixed-precision software and symbolic or exact computation with Maple or similar computer-algebra software.
- PLO 3: Comprehend a selection of the basic algorithms of computer algebra, such as the Euclidean algorithm, polynomial remainder sequences, Gröbner bases, regular chains.
- PLO 11: Complete and document an extended calculation using Maple.
- PLO 15: Contribute to team solutions of computer laboratory problems.

Pedagogy and modes of assessment.

Course material is first presented in lectures, with demonstrations. Material is reinforced with weekly supervised laboratories providing hands-on experience. Assessment is through the submission of assignments containing small-scale problems; one larger-scale project with report; a final examination taken in a laboratory at a computer station.

4. Course Materials

[The Maple Computer Algebra System is available on all university Genlab computers. Maple has an extensive help system, and Maplesoft maintains many online resources.](#)

The following books will be placed on reserve in the Taylor library.

- R.M. Corless, Essential Maple, Springer
- Geddes, Labahn, Czapor, Algorithms for Computer Algebra, Kluwer
- von zur Gathen, Gerhard, Modern Computer Algebra, CUP

Students should check OWL (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Assignments (#)	40 %
Project	10 %
Laboratory Exam	50 %

Assignment due dates: Sept 23, Oct 7, Oct 21, Nov 22.

Project due date: Dec 6.

Laboratory exam: Dec 5.

Date of make-up exam: January 18, 2020.

6. Accommodation and Accessibility

Note that if documentation (medical or otherwise) is required, it can only be collected by the student's Dean's Office/Academic Counselling unit.

[The following is "placeholder text" – the Registrar's office is in the process of creating new text consistent with the new policy on academic considerations.]

If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a self-reporting of absence or via the Dean's Office/Academic Counselling unit of your Home Faculty. If you are a Science student, the Academic Counselling Office of the Faculty of Science is located in NCB 280, and can be contacted at scibmsac@uwo.ca.

For further information, please consult the university's policy on academic consideration for student absences:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf.

The handling of medical and non-medical absences; if a student has received academic accommodation, missed components will be replaced by alternative assignments.

If you miss the Final Exam, please contact your faculty's Academic Counselling Office as soon as you can. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

7. Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

[The laboratory examination will take place on university computers, not personal laptop computers.](#)

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

8. Support Services

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at 661-2147 if you have any questions regarding accommodations.

The policy on Accommodation for Students with Disabilities can be found here: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf

The policy on Accommodation for Religious Holidays can be found here: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mental_health) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.