Western Science

Department of Mathematics

Applied Mathematics 4615A Course Outline
Applied Computer Algebra

1. Course Information

Course Information
AM 9563A Applied Computer Algebra,
Fall 2021,
Lectures: Tuesday 1:30-3:30 HSB-35
Laboratory: Thursday 1:30-2:30 HSB-13 (This is a computer "Genlab")

List of Prerequisites
Previous experience with scientific computing will be beneficial. The course will assume a knowledge of calculus and linear algebra.

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

Instructors	Email	Office	Phone	Office Hours
Prof. D. Jeffrey	djeffrey@uwo.ca	MC 252	88776	Th 2:30

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

3. Course Syllabus, Schedule, Delivery Mode

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:

- 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.

Classes begin: September 8, 2021
Reading Week: November 1–7, 2021
Classes end: December 8, 2021

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 (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.

4. Course Materials

The Maple Computer Algebra System is available on all university Genlab computers. Additional sources for Maple are described in an attachment at the end of this outline.
Instructions

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 are responsible for checking the course OWL site (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.

All course material will be posted to OWL: http://owl.uwo.ca.

If students need assistance with the course OWL site, 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.

Technical Requirements
In the event of switching to online delivery: stable internet connection, computer with working microphone and/or webcam.

5. Methods of Evaluation

A statement of the methods by which student performance will be evaluated and the weight of each, including the number and schedule of assignments (due date), is required. For example:

The overall course grade will be calculated as listed below:

Assignments (4)	40 %
Project/Essay	15 %
Final Exam	45 %

6. Student Absences

Academic Consideration for Student Absences
Students who experience an extenuating circumstance (illness, injury or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration through the following routes:

(i) Submitting a Self-Reported Absence (SRA) form provided that the conditions for submission are met. To be eligible for a Self-Reported Absence:

- an absence must be no more than 48 hours
- the assessments must be worth no more than 30% of the student's final grade
- no more than two SRAs may be submitted during the Fall/Winter term

(ii) For medical absences, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to the Academic Counselling office of their Faculty of Registration.

(iii) Submitting appropriate documentation for non-medical absences to the Academic Counselling office in their Faculty of Registration.

Note that in all cases, students are required to contact their instructors within 24 hours of the end of the period covered, unless otherwise instructed in the course outline.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For the policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs, see:

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

and for the Student Medical Certificate (SMC), see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (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" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

6. Accommodation and Accessibility

Accommodation Policies
Students with disabilities work with Accessible Education (formerly SSD), which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf,

7. Academic Policies

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

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

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 final exam will require all students to use Maple in a university Genlab.

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.

In the event of a return to online instruction, Remote Proctoring Software may be used in this course. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

https://remoteproctoring.uwo.ca.

8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

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 Accessible Education at (519) 661-2147 if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital/.

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/mentalhealth) 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.

Western University
Maple 2021 for Students
Windows | Macintosh | Linux

ACCESS

Western's current site license agreement with Maplesoft allows undergraduate students to access Maple from either Western-owned equipment or a virtualization service on campus.

Here is what you need to know about both options:

(1) General Student Computing Labs or Department Labs

Access Maple from any of the general student labs (also known as Genlabs) that are currently open on campus (https://wts.uwo.ca/genlabs/). Also check with your department as Maple may be installed on systems in labs that are available to you.

(2) MyVLab

This virtual service (hosted by Western Technology Services) provides students (and faculty) access to Maple and many other applications in two ways:

> VMware Horizon Client (preferred)

If you have installed the Horizon View Client before, you should ensure it is also up to date. The setup page for each OS also includes instructions to get the current version of the software.

Setup instructions:

- Windows: https://myvlab.uwo.ca/setup_instructions/windows.html
- Mac: https://myvlab.uwo.ca/setup_instructions/mac.html
- Linux: https://myvlab.uwo.ca/setup_instructions/linux.html

> Web Access Client

This method allows you to log into MyVLab directly from any web browser.

Setup instructions:

- Visit: https://myvlab.uwo.ca/setup_instructions/web_client.html

Student Edition Download ($)

If you do want to install the software on your personal system, the Maplesoft web store offers a full version of its Maple software to students at a greatly reduced price. There may even be a promo code* available for a free download.

Follow these steps to purchase and download the current version:

- Go to: https://webstore.maplesoft.com/index.aspx
- Category: select > Student
- Location: select > Canada

Once the purchase process is complete, Maplesoft will send you an email (within a business day) with your permanent license information and a unique activation code for the software download.

**At various times during the pandemic, Maplesoft has provided Western with a unique promo code allowing students free access to their software for a limited amount of time (usually the length of a term). If you did not receive a promo code for your course, you or your instructor can email us (sitelic@uwo.ca) and we will ask Maplesoft on your behalf. When you send your request, please include your course details plus your instructor's name and email address.*