The University of Western Ontario
Faculty of Science

DEPARTMENT OF APPLIED MATHEMATICS

AM 4615F/9563A – Introduction to Applied Computer Algebra
COURSE OUTLINE 2018-2019

Course Website : The course website will be available on the owl system, at owl.uwo.ca

Description
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 project in computer algebra and present it to the class.

Prerequisites
Unless you have either the prerequisites 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. The prerequisites for this course are Calculus 2302 or 2502, and Linear Algebra 1600. A computer programming course will be a distinct advantage. Basic knowledge of complex variables will be assumed, and a course such as Applied Mathematics 3811 will be an advantage.

Corequisites
None

Antirequisites
None.

Contact Hours
The course will be taught as a combination of lectures and laboratory sessions. 3 hours per week, mixed lectures and laboratory sessions, 0.5 FTE course.

Lecture section : Tuesday 1:30 – 3:30, AHB (Arts and Humanities Building)-1B04.
Thursday 1:30-2:30 AHB 1B04.
Laboratory sections: TBA

Instructor
Prof. D. Jeffrey (MC 255) Telephone: 519-661-2111 ext: 88776
email: djeffrey@uwo.ca

Teaching Assistants : None

Required Text
No required text. Electronic resources will be distributed as needed.
Reference Texts

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 der Gathen, Gerhard, Modern Computer Algebra, CUP

Course Notes
Course notes will be available for download from the course website.

Units
SI units will be used in lectures and examinations.

General Learning Objectives

Knowledge Base	X	Individual Work	x	Ethics and Equity	
Problem Analysis	X	Team Work		Economics and Project Management	
Investigation		Communication	X	Life-Long Learning	X
Design		Professionalism			
Engineering Tools	X	Impact on Society			

General Learning Objectives
The general objectives for student are:
- A familiarity with the Maple computer algebra system.
- An ability to apply Maple to the solution of typical mathematical problems arising in science.
- An ability to write Maple functions and procedures.
- An understanding of some of the main algorithms of computer algebra.

Specific Learning Objectives

- 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; Risch algorithm.

Evaluation

Students can choose between two options for their evaluation.

Option 1: 100% project.

A sizeable project with report and presentation. The project will be chosen in consultation with the instructor. Projects connected with research programs being pursued by the student are allowed and encouraged. The direction of faculty members other than the instructor is allowed.

Option 2: 60% assignments and tests; 40% minor project.

Assignment 1	10 %
Assignment 2	10 %
Assignment 3	20 %
Laboratory Examination	20 %
Project	40%
Total	100%

Tests and Examinations

The laboratory Examination will take place in a university computer laboratory and will be open book.

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:

1. 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).

2. Plagiarism Checking: The University of Western Ontario uses software for plagiarism checking. Students may be required to submit their written work and programs in electronic form for plagiarism checking.

3. Prerequisites for a course: Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will 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.

4. If computer-marked multiple-choice tests and/or exams are given: Use may be made of software to check for unusual coincidences in answer patterns that may indicate cheating.

August 4, 2018/djj