

Subject AM2402A Course Outline

1. Course Information

Course Information

Applied Mathematics 2402a – Ordinary Differential Equations.

Lectures M/W/F 2:30 pm – 3:30 pm, NCB 117.

Tutorials/Labs (1) Thursday 8:30 HSB-13 (2) Friday 8:30 NCB-105 (3) Friday 9:30 HSB-13

List of Prerequisites

A minimum mark of 60% in Calculus 1301A/B, or a minimum mark of 55% in Calculus 1501A/B or Applied Math 1413, or special permission.

Unless you have either the requisites for this course or written special permission from Science Academic Counselling or the instructor 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
Dr. D. J. Jeffrey	djeffrey@uwo.ca	MC272	88776	Friday 3:30-5
T/A to be arranged				

Students must use their Western (@uwo.ca) email addresses when contacting their instructor and include on the subject line AM2402

Office hours will follow the Friday lecture.

3. Course Syllabus, Schedule, Delivery Mode

An introduction to first order differential equations, linear second and higher order differential equations with applications, complex numbers including Euler's formula, series solutions, Bessel and Legendre equations, existence and uniqueness, introduction to systems of linear differential equations. 3 lecture hours, 1 laboratory hour, 0.5 course.

The tutorials / laboratories will be held in university "Genlabs" so that computer software can be used. The default program is Matlab, but other software is available and can be used instead.

Learning Outcomes

After successfully completing this course, you will be able to:

- Recognize and classify differential equations (DEs).
- Verify solutions to ordinary DEs.
- Explain the terms in a DE model of a physical process.
- Describe the meaning of equilibria and stability for DEs and systems of DEs.
- Describe the meaning of eigenvalues and eigenvectors for a system of linear DEs.
- Recognize the appropriate direction field for a first-order DE or DE system.
- Apply appropriate analysis techniques to solve first-order DEs, second-order linear DEs with constant coefficients, systems of first-order linear DEs with constant coefficients.
- Apply and solve higher order DEs using the following methods: variation of parameters, undetermined coefficients.
- Recognize the appropriate phase-plane diagram, illustrating nullclines and equilibria for nonlinear DE systems.
- Construct series solutions to a DE.
- Analyze DEs and DE systems for equilibria and stability.
- Demonstrate an understanding of Newton's Method for numerical solutions of DEs and prove convergence of Newton's Method to the exact solution.
- Identify the appropriate mathematical technique to apply to a given initial value problem, use this technique to obtain a solution, and interpret the physical meaning of the results.
- Given a description of a physical process in the form of a word problem, identify appropriate DE models of the process.
- Evaluate the validity of model assumptions in a DE model of a physical system.
- Identify the long-term predictions of such a model based on the use of the analytical techniques described above.

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Classes begin: September 7, 2023

Fall Reading Week: October 30 – November 5, 2023

Classes end: December 8, 2023

Exam period: December 10 – 22, 2023

Last day to drop the course without academic penalty: November 13, 2023.

Contingency plan

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

4. Course Materials

Elementary Differential Equations with Boundary Value Problems, by William Trench (2013) is required. This is a free online textbook; a copy is available on OWL. The Student Solutions Manual for this text is also freely available.

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

Students are welcome to use their own laptops for computer assignments. The university licence does not allow undergraduates to download Matlab, but it is available through MyVLab.uwo.ca.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

In-Class Quiz (1)	10%	(October 16, 2023, 2:30-3:30)
Laboratories (2)	10%	(Deadlines for report submission TBA)
Midterm Test	30%	(November 8, 2023. 7pm-9pm)
Makeup Midterm		(November 11, 2023. 5pm-7pm)
Final Exam	50%	(Final exam period)

6. Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade:

For work worth less than 10% of the total course grade, the instructor is empowered to grant academic considerations without referring students to their academic counsellors. Note that in all cases where documentation (medical or otherwise) is required, it can *only* be collected by the student's Dean's Office Academic Counselling unit.

This course has two assignments worth 5% each. These will be issued with a submission deadline. Students who are unable to submit before the deadline can apply for academic consideration and obtain a one-week extension to submit. University policy requires that necessary documentation can only be collected by counsellors.

Assessments worth 10% or more of the overall course grade:

By policy, academic considerations for work totalling 10% or more of the final course grade can be granted only by the student's Faculty of Registration (typically by their academic counsellors).

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

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

The Student Medical Certificate is available at

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

Students granted accommodation will be offered make-up exams. The midterm make-up has been scheduled above. Make-ups for the in-class quiz will be scheduled as required during scheduled tutorial times. If a student cannot attend make-up exams or quizzes, credit will be reweighted to the final exam.

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](#)).

Note: missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is **not** sufficient on its own.

6. Accommodation and Accessibility

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>.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, 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 their official university address is attended to in a timely manner.

Calculators are not allowed in the written exams.

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.

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

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/>.

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

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

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

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<https://learning.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.

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/>.

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