

The University of Western Ontario

Course Outline – AM3813B (FW 2022-2023)

This course outline is as of December 18, 2022. It may be updated later.

1. Course Information

Course Name: Applied Mathematics 3813B:
Nonlinear Ordinary Differential Equations and Chaos

Time and Location: Lecture – Section 001, **in-person**. Note that all Quizzes, Midterm Test and Final Examination are scheduled **in-person**.

Monday, Wednesday, Friday: 1:30 - 2:30 pm, Room HSB-11

Prerequisites: AM2402A, or former Differential Equations 2402A; Cal2303A/B or Cal2503A/B and Math 1600A/B or the former Linear Algebra 1600A/B.

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

Instructor: Dr. Pei Yu, Professor, Department of Mathematics

Office: MC 283

Email: pyu@uwo.ca

Office hours: Tuesday, 2:30-4:30 pm

TA: (TBA)

Office hour: (TBA)

3. Course Syllabus

Course Description: This course is primarily an introductory course in Nonlinear Ordinary Differential Equations (NLODE), covering classical and modern nonlinear dynamical systems theory and methodology in both difference and differential equations. The materials involve geometric qualitative approach and algebraic quantitative computation. The topics include “solvable” nonlinear ODEs, perturbation methods, stability and bifurcation, attractors and repellers, chaos and fractals. Maple/Matlab will be used for solving nonlinear ODEs and simulation.

Learning Outcomes: By the end of this course you will be able

- to analytically solve basic nonlinear ODEs;
- to apply perturbation methods to find approximate solutions of nonlinear ODEs;
- to use Maple/Matlab to simulate nonlinear ODEs;
- to use the methods learned from this course to study chaotic systems.

Classes begin: January 9, 2023

Reading Week: February 18-26, 2023

Classes end: April 10, 2023

See the schedule for the lecture/assigned problems, etc. from the “Course Content” on the OWL.

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, affected 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 quizzes/midterm will also be conducted online as determined by the course instructor.

4. Course Materials

Course Notes: Pei Yu and Chris Essex, “Nonlinear Differential Equations and Chaos”, Department of Applied Mathematics, Western University, available from the OWL.

Notes:

- The main material of this course is the Lecture notes, and other textbooks provided in a list can be used as reading materials.

- Additional materials including the use of Matlab and Maple to solve Differential Equations will be also posted on the OWL.
- You should check OWL (<http://owl.uwo.ca>) on a regular basis for news and updates.
- If you need assistance, you can contact the Western Technology Services Helpdesk. They can be reached by phone at 519-661-3800 or ext. 83800.

Course website: The official website for this course is the course page on OWL (<http://owl.uwo.ca>). All information about this course including the course outline, practical problems, exams, lectures, etc. will be posted only on OWL. You should check the OWL on a regular basis for news and updates.

Technical Requirements for teaching online: For lecture classes, you need stable internet connection, computer with working microphone and/or webcam.

5. Methods of Evaluation

Assignments (5) — the first 5 of 7 assignments	15%
Quizzes (2) will be run in the lecture hour. At least one quiz requires you to solve nonlinear ODEs using computer software (Matlab and Maple).	
Quiz 1: February 1, 2023 (In-person, lecture time)	10%
Quiz 2: February 27, 2023 (In-person, lecture time)	10%
Midterm Test: Wednesday, March 9, 7:00-9:00 pm, (Room TBA)	25%
Make-up Midterm: (March 16, time and location TBA)	
Final Exam: (TBA, In-person)	35%
Participation (class attendance):	5%
<ul style="list-style-type: none"> • All materials covered in lectures and assigned problems can be considered testable in the quizzes, midterm and final examination. The problem sets are designed to enhance understanding of the lectures and to develop problem solving skills, which will not be collected and marked. 	

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6. Student Absences

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

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/accommodation_medical.pdf.

The Student Medical Certificate is available at

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

No Make-up for missed quizzes will be arranged. If you receive an accommodation from the Dean's office, the instructor will give a mark for your missed quiz based on your course average after the final examination. A missed quiz has a score blank and OWL will reweigh automatically.

Absences from Final Examinations:

If you miss the Final Exam, you need to 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).

7. 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](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf).

Accommodation for Illness: A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Students Health Services. A link to the Student Medical Certificate is here:

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

and the policy can be found in

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

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your faculty's Dean's Office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from your faculty's Dean's Office immediately. For further information please see: http://www.uwo.ca/sci/academic_counselling.

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Students Health Services. The form can be found here: <https://studentservices.uwo.ca/secure>.

8. 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.

Statement on Use of Electronic Devices: Calculators, computers, cellphones or any electronic devices which can be used for communication, are not allowed to be used in the quizzes, midterm test and final exam.

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.

Remote Proctoring Service: All the quizzes, midterm and final examination in this course will be conducted **in person**. In the event of a COVID-19 resurgence, the teaching will be changed to **online**, and the tests will be proctored using Zoom through OWL. 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>.

9. 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/>.