

## AM3813A (Fall 2024) — Course Outline

### 1. Course Information

#### Course Information

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

**Time and Location:** Tuesday: 2:30 - 4:30 pm; Thursday: 2:30 - 3:30 pm

**Prerequisites:** Applied Mathematics 2402A/B; Calculus 2303A/B or Calculus 2502A/B;  
plus one of Mathematics 1600A/B, Mathematics 1700A/B, Numerical and  
Mathematical Methods 1411A/B, or the former Applied Mathematics 1411A/B.

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) 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

Full name, title and appropriate contact information of the instructor and, if the course is taught by more than one instructor, the name of the person responsible for the course (course coordinator).

Instructors	Email	Office	Phone	Office Hours
Dr. Pei Yu	pyu@uwo.ca	MC 283		Wednesday, Friday: 4:00- 5:00 pm
TA				

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

The instructor's office hours hold in person in the instructor's office (MC 283).

### 3. Course Syllabus, Schedule, Delivery Mode

**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.

**Lectures** – Section 001, **in-person**.

Note that all Quizzes, Midterm Test and Final Examination are scheduled **in-person**.

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

Classes Begin: September 5, 2024

Last Day to Add the Course: September 13, 2024

National Day for Truth and Reconciliation: September 30, 2024

Reading Week: October 12-20, 2024

Last Day to Drop the Course: December 2, 2024

Classes End: December 6, 2024

Examination Period: December 9-22, 2024

### 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.

**Course website:** All course material will be posted to OWL: <https://westernu.brightspace.com/>. All information about this course including the course outline, practical problems, exams, lectures, etc. will be posted only on OWL.

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace 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:** For lecture classes, you need stable internet connection, computer with working microphone and/or webcam.

## 5. Methods of Evaluation

### Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

<b>Assignments (5)</b>	— taking the best 5 of the first 6 assignments, Approximately one assignment every two weeks. The last one assignment gives questions for review, which will not be marked.	15%
------------------------	--	-----

<b>Quizzes (2)</b>	will be run during the lecture hour.	
--------------------	--------------------------------------	--

<b>Quiz 1:</b>	Thursday, October 3, 2024	10%
----------------	---------------------------	-----

<b>Quiz 2:</b>	Thursday, October 31, 2024	10%
----------------	----------------------------	-----

<b>Midterm Test:</b>	Thursday, November 14, 2024, 7:00-9:00 pm	25%
----------------------	---	-----

**Make-up Midterm:** Thursday, November 21, 2004 (time and room TBA)

See the **Course Content** on the OWL for the material covered in each of assignments and quizzes, and the midterm test.

<b>Participation</b> (class attendance):	5%
--	----

<b>Final Exam:</b> (In-person, Period: December 9 – 22, 2024)	35%
---	-----

**Note:** 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.

### General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar:  
[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/academic\\_consideration\\_Sep24.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf),

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

[https://registrar.uwo.ca/academics/academic\\_considerations/](https://registrar.uwo.ca/academics/academic_considerations/)

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Examinations scheduled during official examination periods (Defined by policy)
- Midterm (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration)

When a student mistakenly submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

## Evaluation Scheme for Missed Assessments

**Deadline with a No-Late-Penalty Period for Assignments:** Since students are given the opportunity to take the best 5 of 6 assignments, their request for an Academic Consideration without supporting documentation will be denied. If the submission of an assignment is beyond **48 hours** past the deadline, a late penalty of 20% per day will be applied.

### Flexible Completion

**Quizzes:** No make-up for missed quizzes will be arranged. For missing quizzes, students can either request an academic consideration without supporting documentation (at most one) or they have to present formal supporting documentation in order to get an academic consideration. The accommodation will be approved by the instructor and students need to report their missing quizzes to the instructor as soon as possible. An approved missing quiz will be given a grade based on the student's course average after the final examination. A missed quiz has a score blank and OWL will reweigh automatically.

**Missing class (attendance):** Accommodation for missing lecture classes needs an approval from the instructor, based on the communication between students and the instructor.

When students miss the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

## 6. Additional Statements

### Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

### 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).

### Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

In accordance with policy,

[https://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp113.pdf](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. One quiz may contain questions which need to use Maple and/or Matlab, for which students can use their own computer for this quiz.

**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:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](https://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 any university-declared emergency, 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>.

## Support Services

Please visit the Science & Basic Medical Sciences Academic Advising 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](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](mailto: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](http://academicsupport.uwo.ca/accessible_education/index.html)

if you have any questions regarding accommodations.

Learning-skills counsellors at Learning Development and Success (<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/>.