

The University of Western Ontario

Applied Mathematics 3813b: Nonlinear Ordinary Differential Equations and Chaos

Classes

- **Term:** Winter 2020
- **Time and Place:** MWF: 10:30-11:30, HSB 11
- **Instructor:** Professor Christopher Essex
- **Office:** MC 270
- **Phone:** x 88782
- **E-mail:** essex@uwo.ca

*The Poodle
“attractor”*

Text Course Notes: AM3813b *Nonlinear Differential Equations and Chaos* by P. Yu and C. Essex, on OWL.

Course Evaluation

- **Attendance:** Classroom attendance is expected.
- **Calendar and Prerequisites:** <http://www.westerncalendar.uwo.ca/Courses.cfm?Subject=APPLMATH&SelectedCalendar=Live&ArchiveID=>
- **Homework:** Evaluations will be based on problems assigned. The solutions will be posted.
- **Midterms:** There will be two in-class midterms: *Wednesday February 5*, and *Wednesday February 12* (>15% of the grade). These will be closed book based on assigned homework problems. ***There are no makeups for missed midterms!*** Classroom attendance is expected.
- **Final Examination:** The final examination is April ??, 2020, ??:00[†]. Some of the final examination will be taken from assigned problems. ***All*** material, up to an any evaluation, will be considered testable.
- **Project:** (project handout to be provided in .pdf) Due by **Friday April 3, 2020, in class!** Late penalties will accrue afterward.
- **Weights:** Final exam: 60%, Midterms: 20%, Project: 15%, Class Participation: 5%

Strategy The Nonlinear Revolution, Solvable Nonlinear DE's and Their Novel Properties, Classical Methods Failure, Classical Perturbation Approximations and Their Failure, Computation and Its Limitations, Chaos: First Encounter, Liapunov Exponents, Why Existence and Uniqueness Matters, Hyperbolic Fixed Points, Hartman-Grobman Theorem, Qualitative Analysis, Poincare-Bendixon Theorem, The Lorenz System and Chaos.

Goals: To effectively articulate how modern understanding of nonlinearity changes how we should think about the complexity of our world, and to be able to demonstrate how and why through modern mathematical techniques.

[†] Date and time to be determined by the higher powers.

Higher powers desire the following information to be on 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 through 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.

5. 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/univsec/handbook/appeals/medical.pdf>

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 Student Health Services. The form can be found here:

<https://studentservices.uwo.ca/secure/medical document.pdf>

6. Please contact the course instructor if you require the material in an alternate format or for other arrangements to make this course more accessible for you. You may also contact services for students with disabilities at X 82147.