Instructor(s): David Iron  
iron@mathstat.dal.ca  Office hours: Mondays and Tuesdays 1:30 to 3 (In my office Chase 322 or by room set up in Collaborate Ultra)

Lectures: Lectures held online Tuesday and Thursday 10:05-11:25. Lectures will be recorded and available on line.

Laboratories: None

Tutorials: None

Course Description

Qualitative theory is concerned with determining the behaviour of solutions of differential equations without finding explicit solutions. Topics are selected from Liapunov stability theory, stable and unstable manifolds of singular points and periodic solutions, classification of plane singular points, structural stability and Hamiltonian systems. Other topics at the instructor’s discretion.

Course Prerequisites

Math 4190

Course Exclusion

Learning Objectives

The analysis of continuous and discrete dynamical systems. We will consider both local and global bifurcations, Hamiltonian systems, Normal Forms and Chaotic systems.

Course Materials

Text: Introduction to Applied Nonlinear Dynamical Systems and Chaos by Stephen Wiggins
(Not required)
Course Assessment

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight (% of final grade)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>100%</td>
<td>Sep 24, Oct 8, Oct 22, Nov 5, Nov 19, Dec 10</td>
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<tr>
<td>Tests/quizzes</td>
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<tr>
<td>Final exam</td>
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<td>(Scheduled exam period)</td>
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Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale:

- A+ (90-100)
- B+ (77-79)
- C+ (65-69)
- D (50-54)
- A (85-89)
- B (73-76)
- C (60-64)
- F (<50)
- A- (80-84)
- B- (70-72)
- C- (55-59)

Course Policies

- Late homework will be penalized at 10% per day.
- Homework will be accepted as on time up to 6:00pm on the due date. Email submissions will be accepted, but must be a single file.
- The university policy states that all cases of academic misconduct must be handled through official channels.

I have no latitude in this matter. I do encourage people to work in groups, but I must insist that each student write up their own homework. Please read the paragraph on academic honesty in the Calendar.

Course Content

- week of Sep 7: Equilibria, linearized stability and Liapunov Functions
- weeks of Sep 14: Invariant Manifolds and nonlinear systems
- weeks of Sep 28: Periodic Orbits
- week of Oct 5: Poincare Maps
- weeks of Oct 12: Lagrange Equations
- weeks of Oct 26: Hamiltonian Vector Fields
- week of Nov 9: Reading Week
- week of Nov 16: Centre Manifolds
- week of Nov 23: Normal Forms
- week of Nov 30: Homoclinic Orbits
- week of Dec 7: Introduction to Chaos