MTH645 - Advanced Ordinary Differential Equations I (Fall 2013)

When: Tuesday and Thursday 12:30PM-1:50PM
Where: MATH 150

Instructor: Avner Peleg
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Office hours (tentative): Monday 4:00PM-5:00PM, Tuesday 3:00PM-4:00PM.

Textbook: Differential Equations and Dynamical Systems, Third edition, L. Perko, Springer (2001).
Additional textbook: Differential Dynamical Systems, First edition, J.D. Meiss, SIAM (2007).
Note that for this course you only have to get the book by Perko. The book by Meiss is optional.

Prerequisites: MTH306, MTH309, and MTH431 all with a grade of C or higher.

Tentative syllabus: Chapters 1-3 in L. Perko's book.

Course description:
(1) Linear systems with constant coefficients: existence and uniqueness theorem, complex and repeated eigenvalues, stability theory.
(2) Nonlinear systems - local theory: existence and uniqueness theorem, linearization, the stable manifold theorem, stability and Liapunov functions, classification of equilibrium points, gradient and Hamiltonian systems.
(3) Nonlinear systems - global theory: global existence and uniqueness theorems, limit sets and attractors, periodic orbits and limit cycles, the Poincaré map, the stable manifold theorem for periodic orbits, Poincaré-Bendixson theorem, van der Pol and Lienard equations.

Learning outcomes: This course along with MTH646 covers half of the material for the department's second qualifying exam on differential equations. The students should understand the following concepts and know how to implement them in solving ordinary differential equations and in analyzing the behavior of the solutions.
- Existence and uniqueness of solutions to initial value problems for single equations and systems.
- Solution of linear first order systems, especially constant coefficient systems.
- Qualitative analysis for nonlinear systems, phase portraits, classification of equilibrium states, Poincaré-Bendixson theorem, Liapunov functions, Lienard and van der Pol equations.
- Floquet theory and the stability of periodic solutions, stable manifold theorem, invariant manifolds.

Homework: Homework will be assigned each week. Selected homework problems on each assignment will be graded. Homework is an important component of the course and is worth 25% of the final grade. Notice that: (1) Late homework will not be accepted. (2) It is your responsibility to show your work and to present it in readable form. Unreadable answers or answers without justification will not receive credit.

Exams: There will be one midterm exam and a final exam. The midterm exam is scheduled for Tuesday, October 22 between 12:30PM-1:50PM in Math150. The time, date, and location of the final exam will be announced when they become available. The weight of the midterm exam is 30%, and the weight of the final is 45%.

Grade:	Homework	25%
	Midterm	30%
	Final	45%

The final number grade will be translated to a letter grade, and the translation will not be worse than:

85-100	A
70-84	B
60-69	C
50-59	D
0-49	F

The boundaries for plus/minus grades (A-, B+, B-, etc.) will be determined only after the final exam.

Course web site: http://www.math.buffalo.edu/~apeleg/mth645.html
This web site will be updated with announcements and homework assignments. It is recommended that you visit the web site on a regular basis.

Attendance: Students are expected to attend every scheduled class. All students attending the class must be registered for the class.

Make-up exams: There will be no make-up exams (for the midterm). If due to severe circumstances beyond your control (car accident, illness, etc.), you will not be able to take the midterm exam, please call me immediately (before the exam) and let me know your situation. If you have a good reason and can present convincing documentation as to why you are not able to take the midterm exam, your final grade will be calculated without taking into account the midterm exam.

Academic integrity: Students are expected to behave in accordance with the university policy on academic integrity. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Cheating and plagiarism will result in formal charges.

Incomplete: A grade of incomplete (I) will be assigned only under extraordinary circumstances, which are beyond the student's control (like a non-elective surgery during the last week of class).

Students with disabilities: If you have a diagnosed disability (physical, learning or psychological), which will make it difficult for you to carry out the coursework as outlined, or requires accommodations such as recruiting note takers, readers, or extended time on exams and/or assignments, please advise me during the first two weeks of the course, so that we may review possible arrangements.

Some important dates:

Tue Sep 3: Last day to drop/add the course (no record will appear on your transcript if you drop the course).
Thu Sep 5: No MTH645 class (Rosh Hashanah).
Fri Nov 8: Last day to resign from the course (an "R" will appear on your transcript).
Wed Nov 27 through Sun Dec 1: No class (Fall Recess).
Thu Dec 5: Last MTH645 class.
Fri Dec 6: Semester ends.