

MTH 646 - Advanced Ordinary Differential Equations II (Spring 2010)

When: Tuesday and Thursday 09:30AM-10:50AM.

Where: MATH 250

Instructor: Avner Peleg

Office: Math Building, room 325

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Office hours (tentative): Monday 3:30PM-4:30PM, Thursday 11:00AM-12:00 noon.

Textbook: Differential Equations and Dynamical Systems, Third edition, L. Perko, Springer (2001).

Prerequisites: MTH 645 with grade of C or higher.

Tentative syllabus: Sections 2.11- 2.14 and chapters 3 and 4 in L. Perko's book.

Course description:

(1) Selected topics in local theory of nonlinear systems: Lagrange's equations, Hamiltonian and gradient systems, reversible systems, center manifold theory, normal form theory.

(2) Global theory of nonlinear systems: global existence and uniqueness theorems, limit sets and attractors, periodic orbits and limit cycles, the Poincaré map, the stable manifold theorem for periodic orbits, the Poincaré-Bendixson theorem, van der Pol and Lienard equations, Bendixson's and Dulac's criteria for ruling out closed orbits

(3) Nonlinear systems - bifurcation theory: structural stability and Peixoto's theorem, bifurcations at nonhyperbolic equilibrium points, Hopf bifurcations and bifurcations of limit cycles.

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. (3) Homework submitted via e-mail will not be accepted.

Computational (numerical) problems: some of the assigned homework problems will involve numerical calculations. You may use any computer software to solve these problems. When you submit the solution you should include a description of the software and a list of commands that you used.

Exams: There will be one midterm exam and a final exam. The midterm exam is scheduled for Thursday, March 18. It will take place in the classroom during regular class time. 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 exam 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/mth646.html>

This web site will be updated with announcements, homework assignments and other useful resources. 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 to the class.

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

Studying strategy: Below are some tips on how to do well in the course.

- (1) Review background material at the beginning of the semester.
- (2) Study regularly throughout the semester.
- (3) Read each topic in the book before class.
- (4) Review the theory afterwards using your notes and the book.
- (5) Do the homework regularly.
- (6) Seek help from me when you don't understand something.

Some important dates:

Fri Jan 22: (a) Last day to add/drop the course (no record will appear on your transcript if you drop the course). (b) Last day to file "Petition to make up an Incomplete" with the Math Department.

Mon Mar 8 through Sun Mar 14: No class (Spring Recess).

Thu March 18: MTH646 midterm exam.

Tue March 23: No MTH646 class (AP in OFC, San Diego).

Fri Mar 26: Last day to resign from the course (an "R" will appear on your transcript).

Thu Apr 22: Last MTH646 class.

Mon Apr 26: Semester ends.