Syllabus and grading policy for Math 6307, Fall 2013

Differential equations has been a basic modeling tool for 300 years. It is the preferred modeling method for many problems (e.g. motion of mechanical systems, electrical currents in circuits, etc.) Hence, there are a variety of questions and tools that have been developed.

We will try to review these methods and accommodate different interests. *It is important that you give as much feedback as possible.* The first two weeks will be devoted to get people of different backgrounds on an even keel.

Textbooks

The official textbook for the class is C. Chicone, Ordinary differential equations, Springer This book is available from the library in electronic format.

An excellent book is "Ordinary differential Equations" by J. K. Hale published by Dover.

There are also a set of notes by S.N. Chow, J. Hale, Y. Yi which will be made available to the students.

Chapters of other books and the class notes by the instructor will be made available as needed.

Tentative syllabus

0) Examples and motivations, background in multivariable calculus, real analysis, manifolds. Numerical integration of Differential equations.

1) The functional analysis point of view: Existence, uniqueness, continuation, smooth dependence on parameters.

2) Applications to numerical analysis (depending on interests)

3) Systems of linear equations, homogeneous, non-homogeneous.

4) Stability of solutions.

5) Fixed points, Hartman-Grobman theorem, Invariant manifolds.

5) Periodic orbits, Floquet theory, index.

6) Bifurcations

Workload

• Classes are MWF 10:05-10:55 Skiles 268. Office hours are F: 11–00am 1:00pm and by appointment.

• We will assign homework . It is important to do it because you cannot learn mathematics without doing things.

Homework may be collected. It will not be graded.

We will encourage to do computer explorations. Matlab or Octave are adequate tools.

• Students are supposed to prepare a report on a topic of interest to them that can be negotiated with the instructor. The main goal is that this is useful. It should entail at least 20 hours of reading and preparation. It could be either theoretical or numerical explorations. It could be done in groups of two people, but there should be an statement that both had shared evenly the work.

A one page proposal is due before Oct 14. This proposal needs to be discussed and approved by the instructor. You are encouraged to come to office hours and disucss it.

The report should be handed before the last day of classes.

More detailed suggestions on topics and formats will be given during the lectures.

• Besides the class, there are regular seminars involving the problems discussed both in the school of Mathematics and in the school of Physics. You are encouraged to attend them. Specially the Working seminar in Differential Equations.

The grade will be based on the report handed in as well as the disscussions on the project maintained in office hours and the handing in of homework.