Syllabus for Math 292, Honors Differential Equations, Spring 2013

All reading assignments are to chapters in the online text, *Multivariable Calculus, Linear algebra and Differetial Equations, Part II* by Eric Carlen.

WEEK 1: Jan 23, 24 : Introduction to the course, first order autonomous and linear equations
Reading: Section 1.1 in the online text.

WEEK 2: Jan 28, 30, 31:
Reading: Section 1.2 in the online text. Some special first order non-autonomous equations, introduction to systems; e.g., predator-prey equations.

WEEK 3: Feb. 4, 6, 7: Stability and uniqueness for first order systems. Examples. Introduction to first order linear systems.
Reading: Section 2.1-2.3 in the online text.

WEEK 4: Feb 11, 13, 14: Solving linear systems in general. The superposition principle. Complex eigenvectors and generalized eigenvectors.
Reading: 2.5 in the online text, and notes to be posted.

WEEK 5: Feb 18, 20, 21: The general theory of the matrix exponential, Schur's Theorem.
Reading: 2.4 and 2.6 in the online text.

WEEK 6: Feb 25, 27, 28: Piccard's Theorem. Linearization of non-linear systems. L^p.
Reading: Class notes.

WEEK 7: Mar 4, 6, 7: Inhomogenous linear systems, Duhamel's formula (variation of constants), and driven oscillatory systems: beats and resonance.
Reading: Section 4.1-4.3 in the online text.

• **First Midterm Exam** Wed Thursday 7. This will be based on the material from weeks 1 through 6.

WEEK 8: Mar 11,13, 14: Symmetries and solution by change of variables; homogeneous equations.
Reading: Section 5.1-5.3 in the online text.

WEEK 9: Mar 25, 27, 28: Boundary value problems and the Sturm-Liouville theorems.
Reading: Section 6.1-6.2 in the online text.

WEEK 10: Apr. 1, 3, 4: Introduction to the wave equation; the eigenvalue problem for ordinary differential equations,and the solution of partial differential equations.

Reading: 7.1-7.3 in the online text.

WEEK 11: Nov. 8, 10, 11: Existence of period solutions. The Lienard equation.
Reading: 8.1-8.2 in the online text.

WEEK 12: Apr. 15, 17, 18: Calculus of variations
Reading: 9.1-9.2 in the online text

WEEK 13: Apr 22, 24,25: Numerical methods.
Reading: 10.1-10.3 in the online text.

WEEK 14: Apr 29, May 1,2: Further applications and review.
Reading: Class notes.

• **Second Midterm Exam** Mon., Aprii 29. This will be based on the material from weeks 7 through 14, but also drawing on earlier material.

WEEK 15: May 6 : Further applications and review

FINAL EXAM: