Course Info:
MATH 555 - Introduction to Dynamical Systems
Spring 2015 - Section 001

Time/Place:
M, W, F: 2:30 PM - 3:20 PM, Phillips Hall 381.

Instructor:
Jeremy Louis Marzuola
Contact Info:
E-mail: marzuola@math.unc.edu
Office: Room 324-D Phillips Hall
Office Hours: W: 1:30-2:30 PM, Th: 1-2 PM, F: 9:30-10:30 AM.

Teaching Assistants:
Section 001 - Michael Strayer
E-mail: mcs80@live.unc.edu
Office: 410 Phillips Hall.
Office Hours: Tbd.

Topics:
0. Refresher on systems of ODEs
I. Flows on the Line- General Properties, Geometric Insights, Bifurcations, Periodic Orbits
II. Two Dimensional Flows - Linear Analysis (Linear Algebra refresher), Phase Plane Analysis, Limit Cycles, Bifurcations
III. Higher Dimensional Flows - Chaos, Lorenz Equations, One Dimensional Maps, Fractals (Time Permitting)

Scheduling:
We will attempt to get through Chapters 1-8 for sure and get as far into chaotic dynamics as possible, roughly trying to do one section per class period. This will be greatly assisted if some time is put in PRIOR to coming to class reading the section and developing questions. The book is really, quite readable, please do so! The better prepared everyone is for class, the more time we can spend working on examples and solving problems.
Prerequisites:
The course requires Math 383 or the equivalent. Math 547 or some familiarity with basic Linear Algebra is strongly recommended by the instructor.

Required Course Texts:

Grading:
The course will be graded on weekly homework assignments (30%), one midterm exam (20%), a comprehensive final exam (30%) and a final individual research project (20%).

Homework Assignments:
The homework assignments will be due in class on Fridays beginning January 16th, 2015. The goal will be to have all homework turned back to the students by the following Wednesday for studying purposes. Homework problems will be posted to the course web-page each Friday afternoon and cover from the previous three class periods. No homework will be collected the week of the exam, but the material covered will appear in the assignment due the following week.

Late homework assignments will be accepted only with a valid medical or administrative excuse. Each homework assignment is a total of 15 points, 5 for completion and 10 from 4 randomly assigned problems the TA will grade in full detail.

Though I encourage communication on the homework assignments, each student should write up the assignment on their own. Also, I encourage interested students to learn *Matlab* or *Mathematica* to check their work as we progress through the material.

Exams:
The midterm exam will be in class on Thursday, February 27th, 2015 and will cover material discussed up to last returned homework. The final exam will occur at the standard schedule time according to the University Registrar Schedule, which is Friday, May 5th, 2015 at 8:00 AM.

Projects:
Dynamical Systems arises ubiquitously in both complex mathematical subjects like geometry and differential equations, but throughout applications including computational science, data assimilation, physics, chemistry, climate models, economic forecasting, etc. The goal of the project is for you to explore one of these topics in the area of your particular interest by producing a 5-7 page (not including references) report introducing the topic or application, discussing the relevant ideas from dynamics and doing an illustrative computation or a model simulation to illustrate the idea. The project will be approached in stages with a paragraph suggesting a project idea due by February 13th, 2015. Throughout the semester, there will be further due dates to make sure students are progressing and
working on the research project: a list of references used due by March 6th, 2015; a rough draft due by April 3rd, 2015; the final project due via e-mail by 5 PM on April 24th, 2015; and a final discussion of the projects will be done in small groups on the last day of class.

**Honor Code Statement and Course Policies:**
It is expected that each student will conduct themselves within the guidelines of the UNC Honor System. Upon entering class, all cell phones and laptops should be turned off and put away. Exams will be closed book and without calculators. Please put all cell phones, laptops and calculators away before coming to class for any exam.

**Make-up and Absentee Policy:**
Attendance at every class is strongly encouraged. No make-ups will be given for homework assignments. Missed in-class exams can be made up only if a written medical/coach excuse is provided showing you were unable to attend. No changes are permitted for the final exam without appeal to the Dean.

**Changes to the Syllabus:**
The instructor reserves the right to make changes to the syllabus, including project due dates and test dates. These changes will be announced as early as possible.