Syllabus

Math 8400 – Dynamical Systems & Chaos

Semester: Fall 2015
Time: 5:30-6:45, TR
Where: DSC 165 + computer lab DSC 211B
Instructor: Dr. Dora Matache (call me Dora)
Office: DSC 228
Phone: 554-3295
E-mail: dmatache@unomaha.edu
Web: http://www.unomaha.edu/doramatache/
Office Hours: 1:00-3:00pm TR or by appointment. **Note:** I will NOT give straight answers to your questions! I will only provide guiding questions or comments, so that you can discover the answer yourself. Occasionally you can send questions by email, but make sure you send them in a timely manner. Provide as many details as you can in your emails and use clear, short, and targeted questions or comments. Include problem numbers. Example of a poor question: ”I don’t know how to start this problem, can you help me? Answer: NO, you should be able to think of some meaningful related concepts or make a logical attempt.” Here is a good question: “On this problem I performed the following and I reached this point in the computation where I am not sure what to use to continue. Could you give me a hint? Answer: YES….Hint follows…”

Text: K.T. Alligood, T.D. Sauer, J.A. Yorke, Chaos, An Introduction to Dynamical Systems, Springer 1996, ISBN 0-387-94677-2.

Brief outline: One and two dimensional maps, chaos, fractals, orbits and periodicity, stability, Lyapunov exponents, bifurcations, some important theorems, chaos in differential equations, simulations. Basically these are topics from chapters 1-9 in your book, with possible reference to other chapters if necessary or if time permits.

Grading:

What	Weight	Notes
Homework	40%	Chapter assignments
Midterm Exam, Thursday, October 15, 5:30PM (tentatively)	20%	take home
Portfolio, due last week of school	20%	Each student must turn in the portfolio to get a grade on the final exam
Final Exam, Thursday, December 17, 5:30PM	20%	take home

Final grades will be assigned on the percentage of student's total score out of the total possible score. The normal ranges for grades based on these percentages will be:

Range	Grade	Range	Grade	Range	Grade
98-100%	A+	82-88%	B	70-72%	C-
92-98%	A	80-82%	B-	68-70%	D+
90-92%	A-	78-80%	C+	62-68%	D
88-90%	B+	72-78%	C	60-62%	D-

Grade F otherwise.

Parts of this syllabus are an adaptation of a syllabus written by Dana Ernst (Northern Arizona University).

Learning management system: Blackboard https://blackboard.unomaha.edu/webapps/login/
It is the students' responsibility to check regularly for materials, announcements, updates etc.

Some expectations: In addition to working the class and assigned problems, I expect you to be *reading* from the textbook. Although we will not cover every section of every chapter, you are encouraged to go beyond what can be done in class. The only way to achieve a sufficient understanding of the material is to be digesting it in a meaningful way. You should be seeking clarifications by asking questions in class, outside class, by email to everybody, or posting questions on Blackboard (blog tool, discussions etc.) so that everybody can contribute and learn more. I will not be the first one to answer a question. I expect the students to take charge.

In this course, *everyone* will be required to

- read and interact with textbook and notes on your own or with others;
- write up quality proofs and solutions to assigned problems (yes, you have to use your best math writing skills);
- participate in discussions centered around the covered topics;
- call upon your own prodigious mental faculties to respond in flexible, thoughtful, and creative ways to problems that may seem unfamiliar on first glance.

Homework: You will be required to submit formally written homework assignments at the end of each chapter. All assignments should be *carefully*, *clearly*, and *cleanly* written. Among other things, this means your work should include proper grammar, punctuation and spelling. I expect you to be able to write proofs in detail and in good format. Homework will be collected the first Thursday after finishing a chapter. Homework may include computer simulations (mostly in Matlab). Codes will be provided.

The Homework assignments are subject to the following rubric:

Grade	Criteria
40	This is correct and well-written mathematics.
30	This is a good piece of work, yet there are some minor mathematical errors or some writing errors that need addressing.
20	There is some good intuition here, but there is at least one serious flaw.
10	I don't understand this, but I see that you have worked on it. Maybe we can save this proof! See the hints, or talk to others or me.
0	I believe that you have not worked on this problem enough or you didn't submit any work.

The Homework grade will be the average of all problems. You can choose at most TWO Homework problems that received a score of 10, 20, or 30, and resubmit within one week after the corresponding problem was returned to the class for grade improvement. The final grade on the problem will be the average of the original grade and the grade on the resubmission. Please label the assignment as "Resubmission" on top of any problem that you are resubmitting (together with

 Parts of this syllabus are an adaptation of a syllabus written by Dana Ernst (Northern Arizona University).

the original for comparison) and keep separate from any other problems that you are turning in. Don't forget to write your name.

You are allowed and encouraged to work together on homework. However, each student is expected to turn in his or her own work. In general, late homework will *not* be accepted. However, you are allowed to turn in 1 homework assignment late with no questions asked. Homework turned in after class will be considered late.

Portfolio: Generate an overview of all the important concepts, facts, and techniques you learn in this course. You can regard this as your own mini-textbook on chaos. Although it does not have to include absolutely everything we talk about in class, it should include the main concepts; those that appeal to you more should be emphasized; this means you can (and should) be creative and original. It should be *carefully*, *clearly*, and *cleanly* written. Use a notebook or nice paper for the final version of the portfolio. The first draft will be collected after Fall break. However, you may decide to change your approach later on as you learn more, so prepare to be flexible. More about this later.

Exams: There will be one midterm exam and a cumulative final exam. Both are take-home exams. Make-up exams will only be given under extreme circumstances, as judged by me. In general, it will be best to communicate (extreme) conflicts ahead of time. Examples of non-extreme circumstances: being locked out of the house; car repairs; oversleeping; cat dying for the second time; headache; going on a hunting trip etc. You get the idea; all of these have solutions that need not interfere with turning in your exams. (Don't laugh, I've heard versions of all these excuses over the years☺). Besides, you can always turn in a take-home prior to the deadline.

Attendance: Regular attendance is expected, but you will not explicitly be graded on attendance. Yet, repeated absences may impact your evolution.

Class Etiquette: Students are expected to treat each other with respect. Students are also expected to promote a healthy learning environment, as well as minimize distracting behaviors. Moreover, every attempt should be made to arrive to class on time. If you must arrive late or leave early, please do not disrupt class.

Please turn off the ringer on your cell phone. I do not have a strict policy on the use of laptops, tablets, and cell phones. You are expected to be paying attention and engaging in class discussions. If your cell phone, etc. is interfering with your ability (or that of another student) to do this, then put it away, or I will ask you to put it away.

Final important word: Have fun! This is an awesome class. Students always enjoy it, despite the hard work and challenges. I dare to say that your brain will grow this semester.

 Parts of this syllabus are an adaptation of a syllabus written by Dana Ernst (Northern Arizona University).