MAT 351
Differential Equations: Dynamical Systems and Chaos

MWF 10:30-11:25 Old Chemistry Building 138

Instructor Araceli M. Bonifant
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Office Hours: Monday, Thursday 2:00 -3:00 pm, Wednesday by appointment

Textbook: An Introduction to Chaotic Dynamical Systems, Second Edition by Robert Devaney, Addison Wesley.

About the course: The aim of this course is to introduce the students into the mathematical field of dynamical systems.

We will study hyperbolicity, symbolic dynamics, topological conjugacy, structural stability and chaos.

This course will be a rigorous mathematics course where students will be required to understand all of the definitions, theorems, proofs and so forth. Students will often be asked to explain mathematical concepts in essay questions on exams and quizzes to prove certain facts, and to write concisely and accurately about the mathematical ideas of the course.

During the semester students will be required to develop some projects. The objective of these projects is to help students to understand better the material covered in class, expand their knowledge of certain areas, get new examples, etc. If the project consists of reading some paper, the student will be required to write a report of such paper. Students could also be asked to explain the paper in class.

A tentative syllabus will be updated according to the progress of the class.

Prerequisites: MAT 351 is an undergraduate level course designed for students who have already taken MAT 203 or 205 or AMS 261; MAT 303 or 305 or AMS 361: MAT 200 or permission of the instructor.

Grading Policy:

Your grade will be determined by your scores on

- Midterm : 25%
- Final : 35%
- Quizzes : 20%
- Projects : 20%

Homework: Homework will be assigned weekly but not collected or graded. However the weekly quiz it may based on some of the homework assignments.

Quizzes There will be weekly quizzes every Friday. There will be no make up quizzes or midterm.

Projects: The projects should be done in groups of 2 or 3 students. Once a project has been chosen, the students in the group are required to read, discuss and fill out the corresponding gaps in the paper or section in the book. All papers are written at elementary level. During the last week of the term, students will be required to hand in their project and if time allows it the most exciting ideas of the project will be presented

in class.

Exam Schedule:

Midterm : Friday, March 15, Old Chemistry Building 138
Final Exam: Wednesday, May 15, 8:00-10:30 a.m., Old Chemistry Building 138

Students with Disabilities: If you have a physical, psychological, medical, or learning disability that may impact on your ability to carry out assigned course work, you are strongly urged to contact the staff in the Disabled Student Services (DSS) office: Room 133 in the Humanities Building; 632-6748v/TDD. The DSS office will review your concerns and determine, with you, what accommodations are necessary and appropriate. A written DSS recommendation should be brought to your lecturer who will make a decision on what special arrangements will be made. All information and documentation of disability is confidential. Arrangements should be made early in the semester (before the first exam) so that your needs can be accommodated.

MAT 351, Spring 2002

Topics and Assignments

Week	Topics	Assignments
Jan 23 - 25	Examples of Dynamical Systems: 1.1 Preliminaries from Calculus: 1.2	
Jan 28 - Feb 1	Preliminares from Calculus: 1.2 Elementary Definitions: 1.3	Section 1.2 # 4, 5, 6, 7, 8, 9
Feb 4 - 8	Hyperbolicity: 1.4 An Example: The Quadratic Family: 1.5	Section 1.3 # 6, 7, 9, 10 Section 1.4 # 1a, 1k, 2b, 2e, 6
Feb 11 - 15	An Example: The Quadratic Family: 1.5 Symbolic Dynamics: 1.6 Topological Conjugacy: 1.7	Section 1.5: 1, 3, 6, 7, 8
Feb 18 - 22	Topological Conjugacy: 1.7 Chaos 1.8	Section 1.6: 4, 6 Section 1.7: 1,2, 3
Feb 25 - Mar 1	Chaos:1.8 Structural Stability: 1.9	Section 1.8 # 1,3,6, 7, 8, 9, 10
Mar 4 - 8	Sarkovskii's Theorem: 1.10	1.9: Problems assigned in class
Mar 11 - 15	The Schwarzian Derivative: 1.11 **Midterm!**	
		Section 1.11 # 3, 4

Mar 18 - 22	Bifurcation Theory 1.12	Section 1.12 # 1, 6, 7
Apr 1 - 5	Maps of the Circle: 1.14	Section 1.14 # 1,2, 4
Apr 8 - 12	Maps of the Circle 1:14	
Apr 15 - 19	Morse Smale Diffeomorphisms 1:15	
Apr 22 - 26	Presentation of Projects	
Apr 29 - May 3	Presentation of Projects	
May 6 - May 7	Presentation of Projects	
May 15	**Final!!**	8:00-10:00 a.m. Old Chemistry Building 138