SU DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

SYLLABUS (Tentative)

MATH 475/575 Introduction to Dynamics and Chaos

Description: Introduction to mathematical dynamics and chaos. Topics include orbits, bifurcations, Cantor sets and other fractals, symbolic dynamics, fractal dimension, notions of stability, and chaos. Includes motivation and historical perspectives, as well as examples of fundamental maps studied in dynamics and applications of dynamics.

Prerequisites: Calculus II (Math 202) and Discrete Math (Math 210)

Text: "A First Course in Chaotic Dynamical Systems: Theory & Experiment," by Robert Devaney; Perseus Publishing (a division of HarperCollins), 1992.

Topic:	Class Days	
Introduction	3	
Examples, objectives, first spreadsheet experiments.		
Orbits	3	
Iteration, types of orbits, further spreadsheet experiments.		
Graphical Analysis	3	
Graphs, orbits, and phase portraits using spreadsheets.		
Fixed and Periodic Points	4	
Attractors, repellors, theory and experiment.		
Bifurcations	4	
Finding and classifying bifurcations, and spreadsheet analysis.		
The Quadratic Family	4	
Chaotic behavior and Cantor sets		
Transition to Chaos	4	
Orbit diagrams and period doubling. Technology dependent.		
Symbolic Dynamics		
Shifts on sequences and conjugate systems	4	
Chaos		
Definition, examples, and experiments.	4	
Sarkovski's Theorem	2	
Fractals	9	
Definition and examples, including Iterated Function Systems		
Julia Set, Mandelbrot Set	6	
Complex algebra, algorithms, theory, and experiments for J and M.		
Student Presentations	4	
Tests	2	56

EVALUATION

Homework	30%
Project	20%
Midterm Exam	25%
Final Exam	25%

SMH Mar-17