

Math 266 Chaos, Fractals and Dynamical Systems

TTh 2:00 – 3:15pm, 223 Votey

Textbook: *Invitation to Dynamical Systems*, by E.R. Scheinerman

Supplemental materials and interactive websites: available at Yang's homepage.

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Office hours: TTh 1:00pm – 2:00pm. Additional time by appointment.

Problem Sets: homework problems will be given on irregular basis. Computers will be needed. An emba account will be given to you shortly.

Exams: no exams. Just homeworks and a term project.

Grading: homework: 70%; project: 30%.

Topics:

- Brief history
- I. Fractals and chaos in discrete dynamical systems
 - Fixed points, periodic cycles, stability
 - Cantor set, the tent map, chaos
 - Sierpinski triangle
 - Newton's method, Julia sets
 - Dimension of fractals: the Koch curve, the box and Hausdorff dimensions
 - The logistic map: period-doubling bifurcations; Sarkovskii's theorem; the U-sequence; renormalization;
 - Julia sets and the Mandelbrot set
 1. Julia sets
 2. The Mandelbrot set
 3. Mathematical theory
 4. Universality of the Mandelbrot set and Julia sets
 5. Newton's method revisited
 - Strange attractors
 1. The baker's map
 2. Henon map
- II. Continuous dynamical systems and chaos
 - Lorenz equations: chaos and strange attractors