

# Bemidji State University

## MATH 3440: Introduction to Fractals & Chaos

### A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: \*.\*

Lab Hours/Week: \*.\*

OJT Hours/Week: \*.\*

Prerequisites: None

Corequisites: None

MnTC Goals: None

An introduction to the topics of fractal geometry, chaos, and dynamic mathematical systems. Topics included are iteration, fractals and fractal dimension, iterated function systems, Julia set, Mandelbrot set, and bifurcation. Prerequisites: MATH 2210 and MATH 2472. (Might not be offered every year.)

**B. COURSE EFFECTIVE DATES:** 08/22/1997 - Present

### C. OUTLINE OF MAJOR CONTENT AREAS

1. Functions, iteration, orbits of points
2. Attracting, repelling, neutral points
3. Julia and Mandelbrot sets
4. Bifurcation, Feigenbaum plots, periodicity of points
5. Cardinality of sets
6. Analysis of classical fractals
7. Chaotic systems

### D. LEARNING OUTCOMES (General)

1. Understand the fundamental concepts and methods of iteration, orbits and orbit analysis.
2. Analyze problems, discern structure and pattern and make conjectures in elementary iterated systems.
3. Apply creative and analytic thinking to develop clear and valid orbit analysis proofs.
4. Communicate mathematical ideas and understanding effectively.
5. Appreciate the beauty, structure and relationships that exist within chaotic dynamical systems.

### E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

### F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

### G. SPECIAL INFORMATION

None noted