A. Course Description

Credits: 3

Prerequisites: MATH 301 Introduction to Analysis

Lab Hours/ Weeks: None

Corequisites: None

Lecture Hours/ Week :

MnTC Goals: None

This graduate course studies the logical foundations of mathematical analysis using fractal examples to direct our intuition. The tools of analysis give us the machinery for constructing the most complicated mathematical objects, which are used to solve the problems in differential equations, probability, geometry, calculus and functional analysis. Learning how to construct fractals of various types helps us understand the apparatus researchers use to construct solutions to differential equations, stochastic processes, and the most difficult extremal problems. These solutions form the basis of the theories of all classical hard sciences, as well as many new fields such as signal processing, control theory and systems engineering. We will explore the topics of metric spaces and point set topology, measure theory and probability, Hausdorff dimension and chaotic dynamics. This course will serve students with a bachelor's degree in mathematics or closely related fields wishing to deepen their mathematics education, and technical professionals, high school teachers, and math instructors seeking professional development or qualifications for teaching community college courses.

B. Course Effective Dates: 08/20/2018 - Present

C. Outline of Major Content Areas:

See Course Description for major content areas.

D. Learning Outcomes (General)

1. Metric spaces and compactness
2. The contraction mapping theorem,
3. Hausdorff dimension,
4. Measure theory and probability theory,
5. Examples include Iterated Functional Systems, Julia sets, the Mandelbrot set, chaotic dynamics, and the fundamental theorem of ODEs.

E. Learning Outcomes (MN Transfer Curriculum)

This contains no goal areas.

G. Special Information

None