Spring 2016

MATH 431–432: PRINCIPLES OF ANALYSIS I & II (3–3)

Course Description: Topology of $\Re^n$, metric spaces, continuous functions, Riemann integration, sequences and series, uniform convergence, implicit function theorems, differentials and Jacobians. Emphasis on teaching mathematical writing. (These topics are covered in the year sequence Math 431–432. Math 432 should be taken in the same academic year as 431.)

Prerequisite: 431: 311, 321 and 331; or consent.
432: 431 or consent.

Recommended Text. *Introduction to Analysis* by Maxwell Rosenlicht. (There are a number of excellent texts at this level, including *Real Analysis* by Patrick Fitzpatrick, *Introduction to Real Analysis* by Michael Schramm, *Undergraduate Analysis* by Serge Lang and *Principles of Mathematical Analysis* by Walter Rudin)

Core topics:

- metric spaces, Euclidean n-dimensional space, basic topology including compact sets and connected sets.
- functions, continuity and uniform continuity, differentiation, the Mean Value Theorem, Taylor's Theorem, Riemann integration, sequences and series of functions, interchange of limit operations, the Weierstrass approximation theorem.
- jacobians, the implicit function theorem, and the inverse function theorem.
- limsup and liminf of sequences.
- Riemann Stieltjes integration.
- The contraction mapping theorem, with application to differential equations.
- Fourier series.

Math 431–432 is taught only in a writing-intensive format.

Course objectives: Upon successful completion of Math 431 and 432, the student will have an understanding of metric space topology and will be familiar with the rigorous development of calculus of several variables.

Program objectives: The successful student will be prepared to take graduate level courses in analysis, both because of the content of this sequence, which is pre-requisite for such classes, and through continued experience with rigorous mathematics by way of writing proofs and independent reading.