

Department: MATHEMATICAL SCIENCES

Semester Hours: 3

Course Title and Number: MATH 431 - Advanced Calculus II

Course Description: Further study of sequences and series of functions; calculus of functions of several real variables. PRQ: MATH 430.

Course Objectives:

- To reason rigorously in mathematical arguments.
- To communicate mathematics clearly and efficiently.
- To think creatively in abstract situations.
- To understand the unifying nature of abstract mathematical treatments.
- To understand the theory and methods of multivariable calculus.

Content:

- Sequences, infinite series, and series of functions: Infinite series; absolute and conditional convergence: tests for absolute convergence of series; series with variable signs.
- Pointwise convergence and uniform convergence of sequences and series of functions: Weierstrass M-test; integration and differentiation of series of functions; power series; radius of convergence; Cauchy-Hadamard formula; Taylor series.
- Functions of several variables: Topology of \mathbb{R}^n with emphasis on $n = 2, 3$, open, closed sets etc.; limits and limit theorems; continuity of a function of several variables; matrices and linear transformations.
- Differentiable functions of several variables: Partial derivatives; differentiability; directional derivatives; gradient function; chain rule; Mean Value Theorem; Taylor's Theorem for functions of several variables; inverse function theorem; implicit function theorem; constrained and unconstrained extreme value problems; Lagrange multipliers.
- Integration: Integrals over rectangles; iterated integrals; integration over regions; area and volume; line integrals; potential functions; Green's Theorem.

Course requirements: Solutions of more complex problems in concrete and abstract settings. Demonstrate increasing facility in the techniques of advanced calculus. Discussion on depth in mathematics. Reading and writing about concepts. Regular homework collected and graded. Regular quizzes, hour examination and a final examination.

Assessment Instruments: Judgement on student involvement and depth of contributions in class discussions. Homework involving problems, proofs, and computational work. Regular quizzes, hour examination and a final examination.

Current textbook: William F. Trench, *Introduction to Real Analysis*, available online at <http://ramanujan.math.trinity.edu/wtrench/misc/index.shtml>