Syllabus: MA 334 Advanced Calculus I

Last updated Summer 2011

Bulletin description:

This is the first of a two-course sequence designed to provide students with the theoretical context of concepts encountered in MA 125 through MA 227. Topics covered include Completeness Axiom, sequences of real numbers, suprema and infima, Cauchy sequences, open sets and accumulation points in Euclidean space, completeness of Euclidean space, series of real numbers and vectors, compactness, Heine-Borel Theorem, connectedness, continuity, Extremum Theorem, Intermediate Value Theorem, differentiation of functions of one variable. Prerequisite: C or better in MA 227 and MA 237.

Text:

Edward D. Gaughan, *Introduction to Analysis (5th ed.)*, American Mathematical Society 2009, ISBN 978-0-8218-4787-9, or similar text chosen by instructor.

Coverage:

Chapter 0	2.5 weeks
Chapter 1	3 weeks
Chapter 2	2 weeks
Chapter 3	3 weeks
Chapter 4	3 weeks

Note - time allotments are approximate and do not include exams. Division of material between MA 334 and 335 may vary depending on instructor and text.

Learning Objectives:

On completing the course, students should be able to work with axioms and formal definitions, discover and write proofs and construct counterexamples in the context of real analysis of a single variable. They will:

- Understand the reals as an ordered field with least upper bound property
- Be familiar with fundamental concepts of metric topology of the reals, such as open closed sets, compactness and connectedness
- Know the definitions of convergence of sequences and upper and lower limits, and methods of determining limits and convergence
- Know and be able to apply rigorous definitions of limit, continuity, uniform continuity and derivative of functions of a real variable
- Know the statements and understand the proofs of fundamental results such as the Intermediate Value Theorem, Mean Value Theorem, and Inverse Function Theorem, and their consequences
- Be able to constructing “epsilon-delta” proofs and other types of proof that arise routinely in analysis.