MATH 561: Set Theory I

Fall 2001, MWF 8:00–8:50, 113 McAllister, Schedule 826671

Stephen G. Simpson, 333 McAllister, 863-0775, simpson@math.psu.edu

This introductory set theory course will be suitable for all mathematics graduate students, and even advanced undergraduates. The only prerequisite is mathematical maturity.

The textbook will be *Set Theory*, by Kenneth Kunen (paperback). Supplementary textbooks will be *Set Theory*, by Thomas Jech, and *Classical Descriptive Set Theory*, by Alexander Kechris.

Set theory has two aspects.

On the one hand, set theory is an interesting branch of mathematics in its own right, and set-theoretic methods have turned out to be extremely useful for attacking a variety of problems in several other branches of mathematics, including analysis, probability, topology, and combinatorics.

On the other hand, set theory is of great importance as the common foundation or basis for *all* of mathematics. It is widely accepted that *all* mathematical concepts and structures, in *every* branch of mathematics, are to be defined and explained in terms of sets, relations on sets, and mappings between sets. Furthermore, a mathematical proof is commonly regarded as correct if and only if it can be formalized within axiomatic set theory.

From this foundational or axiomatic point of view, it is particularly exciting to consider how the standard Zermelo/Fraenkel axioms may be supplemented or modified by consideration of additional or alternative set-theoretic axioms. Among these are the Axiom of Choice, the Continuum Hypothesis, the Generalized Continuum Hypothesis, Gödel's Axiom of Constructibility, Martin's Axiom, the Axiom of Determinacy, and the various large cardinal axioms.

MATH 561 will provide an introduction to both aspects of set theory, the mathematical and the foundational, with emphasis on the foundational.