Math 558 - Foundations of Mathematics

Fall 2012 - Pennsylvania State University

Overview

Lectures: MWF 1:25 PM - 2:15 PM, Room *104 Osmond Lab*
Instructor: Jan Reimann
Office: 318B McAllister
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Content

This course explores foundational issues of mathematics. At the center will be two notions: *undecidability* and *incompleteness*. Topics include:

- Undecidability of first order number theory (arithmetic)
- The Gödel Incompleteness Theorems
- Hilbert's 10th Problem
- Undecidability in mathematics: Word problems, homeomorphism of manifolds, etc.
- Decidability of the real number system: the Tarski-Seidenberg Theorem and quantifier elimination
- Informal and formal set theory
- The Continuum Hypothesis
- The Axiom of Choice

Material

The core material is covered in *Lecture Notes by Stephen Simpson*, available online.

Exams

There will be *no* final or midterm exam in the traditional form. However, at the end of the semester, each participant has to give a short presentation (~ 30 min) on a topic that extends or elaborates one of the topics covered in class. Each student is also expected to complete a short (5-10 pages) survey paper about the same topic. The topics will be assigned during the first half of the semester.

Homework

Homework will be assigned each week and will be *due the following week* in class. Homework will be graded and the lowest score will be dropped.

Course Grade

The final grade will be determined as follows: *75% homework, 25% project*.

Academic Integrity

All Penn State Policies regarding ethics and honorable behavior apply to this course.

Collaboration: Collaboration among students to solve homework assignments is welcome. This is a good way to learn mathematics. So is the consultation of other sources such as other textbooks. However, *every student has to hand in an own set of solutions*, and if you use other people's work or ideas you *have to indicate the source in your solutions*.
(In any case, complete and correct homework receives full credit.)