

COURSE SYLLABUS FOR MATH 278X: CATEGORICAL LOGIC

COURSE DESCRIPTION This is a course on topos theory and its relationship with point-set topology and mathematical logic.

COURSE WEBPAGE <http://www.math.harvard.edu/~lurie/278x.html>

PROFESSOR Jacob Lurie. Office hours Wednesday 3-4 (or by appointment) in SC 514.

TEXT Detailed course notes can be obtained from the course webpage.

PREREQUISITES A working knowledge of category theory will be essential. Point-set topology. Some familiarity with model theory will be useful (we will review what we need in class, but the exposition will be terse). The course is intended for graduate students; undergraduates should not enroll in the class for credit.

SOME TOPICS: • Classical first-order logic.

- The syntactic category of a first-order theory.
- The theory of pretopoi and its relationship with first-order logic.
- Grothendieck topologies and (Grothendieck) topoi.
- The Barr-Beck monadicity theorem and descent methods.
- Presentations of topoi by topological groupoids.
- Gödel's completeness theorem and Deligne's generalization of it.
- Ultraproducts and Stone-Cech compactifications.
- Ultracategories and the "Strong Conceptual Completeness" theorem of Makkai.