COURSE SYLLABUS FOR MATH 114: ANALYSIS II: MEASURE, INTEGRATION, AND BANACH SPACES

COURSE DESCRIPTION The aim of this course is to introduce some of the fundamental tools of mathematical analysis, such as Lebesgue integration and the rudiments of functional analysis.

MEETING TIME AND PLACE MWF at 12, Science Center 216.

INSTRUCTOR Jacob Lurie (lurie at math dot harvard dot edu).

COURSE ASSISTANT Stephen Mackereth (smackereth at college dot harvard dot edu).

OFFICE HOURS Monday 3-4 or by appointment, in Science Center 514.

TEXT "Real Analysis" (4th edition) by Royden and Fitzpatrick. Errata for the book can be found at http://www2.math.umd.edu/∼pmf/RAE.pdf. Online lecture notes will be provided for topics (such as the theory of the Fourier transform) which the book does not discuss in detail.

COURSE WEBSITE http://www.math.harvard.edu/∼lurie/114.html

PREREQUISITES Students will be assumed to have taken a first course in mathematical analysis, such as Math 112 or Math 23. In particular, the course will assume that students are familiar with mathematical proofs, "ϵ-δ arguments," and basic results about limits, differentiability, metric spaces, continuity, and so forth. We also assume familiarity with linear algebra (the theory of vector spaces and linear maps). Complex analysis is not a prerequisite; this course and Math 113 may be taken independently of one another.

TOPICS
- Lebesgue measure on Euclidean space.
- Measurable sets and measurable functions.
- The Lebesgue integral and its properties (particularly Lebesgue's dominated convergence theorem and Fubini's theorem).
- Square integrable functions and Hilbert spaces.
- Banach spaces. L^p-functions and duality.
- Fourier series. Plancherel's theorem
- Basic principles of functional analysis. The open mapping theorem, closed graph theorem, and uniform boundedness theorem.

GRADING Grades will be based on homework ($\frac{1}{2}$), an in-class midterm ($\frac{1}{4}$), and a final exam ($\frac{1}{4}$). Homework will be assigned on Monday every week (starting in the second week) and will be due on Monday of the following week.

ACADEMIC POLICIES Homework will be assigned on the first class of each week and due on the first class of the following week. Homework submissions should not be handwritten. Collaboration on homework exercises is encouraged. Please acknowledge your collaborators and submit solutions which are written in your own words.