FREE BOUNDARY REGULARITY PROBLEMS

T. TORO

In the 1980's Alt-Caffarelli and Alt-Caffarilly-Friedman initiated the study of minimizing problems with free boundary, since then this field as boomed. In this situation the minimizer satisfies a PDE, and the central question in this area is to study the regularity of the solution as well as the regularity of the free boundary. In this course we will discuss the results in [AC] and [ACF] as well as the work that has sprouted from these seminal works. We will focus on the monotonicity formulae that arise in this context as they are invaluable tools to understand these problems. We will finish the course by showing how apply to the free boundary regularity problems for the harmonic measure and Poisson kernel described in the Math 581

REFERENCES:

- H. W. Alt & L. A. Caffarelli, Existence and regularity for a minimum problem with free boundary, *J. Reine Angew. Math.* **325** (1981), 105–144.
- H. W. Alt, L. A. Caffarelli & A. Friedman, Variational problems with two phases and their free boundaries, *Trans. Amer. Math. Soc.* **282** (1984), 431–461.
- L. Caffarelli and S. Salsa, A Geometric Approach to Free Boundary Problems, AMS, Graduate Studies in Mathematics.
- A. Petrosyan, H. Shahgholian and N. Uraltseva, Regularity of free boundaries in obstacle-type problems, AMS, Graduate Studies in Mathematics.

Schedule: MW 9:00-10:20

Prerequisites: Real or Linear Analysis.