

DEPARTMENT OF MATHEMATICS AND STATISTICS
AND
CENTER FOR COMPUTATIONAL SCIENCES
MISSISSIPPI STATE UNIVERSITY

COLLOQUIUM LECTURES

Semilinear variational problems with discrete spectrum (Two Lectures)

ALFONSO CASTRO

Harvey Mudd College

Thursday, May 5. Lecture 1 at 9:30 am. Lecture 2 at 11:00 am

Allen 14

Abstract. The solvability of equations of the form $Lu + Nu = 0$, where L is a linear operator with discrete spectrum will be considered when the operator $L + N$ is the gradient of a functional defined in a Hilbert space. Boundary value problems for elliptic and hyperbolic partial differential will be discussed.

Principal eigenvalue for linear operators

MARCELLO LUCIA

CUNY-Staten Island

Friday, May 6 at 9:30 am.

Allen 14

Abstract. It is well known that the first eigenvalue of the Laplacian on a bounded domain with zero boundary condition is simple, and does not change sign. This classical result has been extended to more general operator, with coefficients assumed to be sufficiently regular, in order to apply Harnack's inequality. The aim of this lecture is to show that the main properties of the first eigenvalue of the Laplacian can be obtained under very mild assumptions on the coefficients of the differential operator, without using the Harnack inequality. For instance, our results apply when we have weights belonging to some Lorentz spaces.

Some nonlinear Problems arising in chemotaxis

MARCELLO LUCIA

CUNY-Staten Island

Friday, May 6 at 11:00 am.

Allen 14

Abstract. Chemotaxis is a phenomena where some bacteria aggregate under the action of a chemical substance. Such phenomena were already observed in 1935 by K.B. Raper for the cellular slime mold *Dictyostelium*. In 1970, Keller and Segel proposed a mathematical model to describe the evolution and aggregation of these slime mold. I will make an overview of this model, and present some recent uniqueness results obtained with D. Horstmann (University of Cologne)