Mathematics Graduate Seminar

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Thursday, March 2, 2017
1:00p.m., HH-3017

Dynamics in Some Partial Differential Models

Abstract:

In this work, we study dynamics of some partial differential equation models. We start by investigating a liquid film flow along an inclined periodic wavy wall. Based on a long-wave model equation valid at near critical Reynolds number, steady states and their stability are studied. The dynamics of separable solutions to the generalized Burgers equation is investigated in the second part of this work. We reduce the separable solutions of the equation into steady-states of partial differential equation with constant coefficients. The existence and the number of steady-state solutions are founded, and stability of the trivial solution and the small-amplitude positive solution are provided. Next, stability of traveling wave solution to a Lotka-Volterra model is studied. We use the spectrum analysis to study the local stability in a weighted functional space. Comparison principle and the squeezing technique are applied to derive the global stability results. Speed selection mechanism for traveling waves of this model is introduced as a future work. Some current results and open problems are highlighted in the last part of this work.