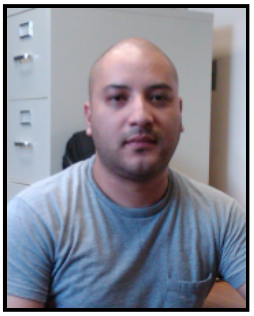

Computational Mathematics Seminar Series

A Diffuse Interface Model for Electrowetting

Abner Salgado, University of Maryland

Johnston Hall 338
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Abstract:
Electrowetting refers to the phenomenon where the surface tension between two fluids can be locally modified by application of an electric field. Thus, wetting behavior can be controlled. This process has found applications in lab-on-a-chip systems, autofocus cell phone lenses, colored oil pixels and others. In this work we present a diffuse interface approach to model electrowetting. This model is fully three-dimensional and takes into account the most significant physical effects: differences between densities of the phases, other phase dependent quantities (conductivity, etc.), and contact line dynamics (including pinning). We show that the obtained model has an energy law and propose a fully discrete scheme that mimics this energy dissipation property. With the help of the proposed scheme we show that the semi-discrete problem (discrete in time, continuous in space) always has a solution. Moreover, the well-posedness of the scheme is not sensitive to the chosen dynamic contact line model. This is especially important since modeling of 3-phase contact line motion is still an open area of research. Preliminary numerical simulations will be presented that illustrate the capability of our model and method. Joint work with Ricardo H. Nochetto (UMD) and Shawn W. Walker (LSU).

Speaker's Bio:
Abner Salgado is currently a Postdoctoral Research Associate at the Department of Mathematics at the University of Maryland. He obtained his PhD in Mathematics in 2010 from Texas A&M University. His main research interests are numerical analysis and numerical methods for incompressible flows.

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