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GRANULAR AND MULTIPHASE FLOWS

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Mechanics Research Communications and the Granular Science Laboratory

Professor Lou Kondic

Department of Mathematical Sciences

New Jersey Institute of Technology

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11:30 a.m. – 1:00 p.m
ME Center: Room 224

Modeling dense granular systems

Basic modeling approaches to granular/particulate systems are still unclear, in particular for dense (high volume fraction) ones. While kinetic theory has been successful in explaining some important features of low volume fraction systems, it is unclear that this powerful approach can be extended to dense ones. Alternatives include discrete element (molecular dynamics) and Monte-Carlo simulations, in addition to various models which are often derived using assumptions whose appropriateness is unclear. An example of a basic question which is just beginning to be answered is the basic type (elliptic/parabolic/hyperbolic) of continuous equations that could potentially describe granular systems.

After giving overview of the field, I will discuss few issues whose understanding may help to develop new models for granular systems. These will include some very basic ideas which we still do not understand well, such as the concept of granular temperature. Next I will concentrate on the particular question of signal propagation through sheared granular systems, and discuss connections to some systems that can be described using well known concepts of fluid dynamics and/or elasticity theory.

Dr. Kondic received his PhD in Physics from the City College of New York. From 1995-97, he held postdoctoral positions at the Courant Institute of Mathematical Sciences and at Duke University. Dr. Kondic has been at NJIT since 1999 and is currently an Associate Professor of Mathematical Sciences, where he conducts research on modeling and numerical simulations of two groups of physical systems: a) two fluid flows with emphasis on the interfacial dynamics and, b) dynamics of granular systems. In the field of granular materials, he has developed analytical models, as well as molecular dynamics simulations of 2D and 3D granular systems, with emphasis on collective effects. His work on the dynamics of thin liquid films involved performing large-scale computational simulations with the goal of understanding contact line instabilities and resulting pattern formation. Currently, he is studying the behavior of granular materials in a microgravity environment, and is working on developing numerical schemes for highly nonlinear partial differential equations related to the flows of thin liquid films.

For further information, please contact Dr. A. Rosato, ME Department (rosato@adm.njit.edu; 973-596-5829).