Topics in Modeling and Computation

- **Title**: The Successive Over Relaxation Method in Multi-layer Grid Refinement Scheme
Speaker: *Leina Wu* (wul@queens.edu), Queens University of Charlotte
Coauthors: *Tsun-zee Mai* (tmai@bama.ua.edu), University of Alabama

Abstract: The successive over-relaxation (SOR) method has been widely used to solve large sparse linear system. When solving a PDE over a rectangular domain with Dirichlet boundary conditions, the multi-layer grid refinement method can be used to generate the linear system, with higher efficiency than uniform grid theme. We will study the SOR method in the multi-layer grid refinement scheme. A heuristic estimation for the optimal parameter in SOR method is given and verified by numerical experiments in this scheme.

- **Title**: The Discrete Agglomeration Model: Equivalent Problems
Speaker: *James L. Moseley* (ye_rast@ncat.edu), West Virginia University

Abstract: Agglomeration of particles in a fluid environment is an integral part of many industrial processes and has been the subject of scientific investigation. One model of the fundamental mathematical problem of determining the number of particles of each particle-size as a function of time for a system of particles that may agglutinate during two particle collisions uses the coagulation or Smoluchowskis equation. With initial conditions, it is called the Discrete Agglomeration Model. Several problems have been associated with this model allowing progress to proceed separately. To facilitate this progress, in this paper we develop equivalent problems.

- **Title**: Droplet Theory of Metastable Decay in the Hyperbolic Plane
Speaker: *Howard L. Richards* (Howard.Richards@Marshall.edu), Marshall University

Abstract: Because of the different dependence of area and circumference on radius, metastable decay is very different in the hyperbolic than in the Euclidean plane. In the hyperbolic plane, the critical droplet radius diverges at a nonzero "spinodal" field, and the metastable decay in finite systems is much more dependent on boundary conditions. These predictions from geometry are confirmed by Monte Carlo simulations run by students in our REU program.

- **Title**: Modeling and Computational Methods for Periodic Photonic Structures
Speaker: *Abdinur Ali* (amali@nsu.edu), Norfolk State University
Coauthors: *Mushtaq Khan* (makhan@nsu.edu), Norfolk State University

Abstract: This paper investigates the computational approach of the electromagnetic fields in photonic crystals. We designed 2-D periodic lattices and explored the photonic band structures. After allowed and forbidden frequencies were located, defects were used to create micro-cavities and waveguides in the photonic band gaps. This talk covers photonic band gaps for both parallel and perpendicular polarizations, eigen frequencies, localized modes, mode volumes and quality factors.