THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

M. E. Taylor Analysis and PDE Seminar

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3:30 - 4:30 p.m.
Phillips Hall 385

A problem for a material surface attached to the boundary of an elastic semi-plane

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Abstract. A problem for a nano-sized material surface attached to the boundary of an elastic isotropic semi-plane is considered. A normal external traction is applied to a boundary of the material surface. The material surface is modeled using the Steigmann-Ogden form of surface energy. The problem is solved by using integral representations of stresses and displacements through certain unknown functions. With the help of these functions, the problem can be reduced to either a system of two singular integral equations or a single singular integral equation. Two types of material surface tip boundary conditions are considered: free tip conditions and conditions with compensated surface prestress term. The numerical solution of the system of singular integral equations is obtained by expanding each unknown function into a series based on Chebyshev polynomials. Then the approximations of the unknown functions can be obtained from a system of linear algebraic equations. Accuracy of the numerical procedure is studied. Various numerical examples for different values of the surface energy parameters are considered. It is shown that both the surface parameters and the type of tip conditions have significant influence on the behavior of the material system.