

# TEMPLE UNIVERSITY

Department of Mathematics

## Analysis Seminar

Room 617 Wachman Hall

Monday, April 8th, 2024, 2:30 p.m.

*Applications of surface energy in the  
Steigmann-Ogden form to study of nano-sized  
reinforcements in elastic material*

by Anna Zemlyanova

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**Abstract:** In this talk, we study a problem concerning a nano-sized material surface attached to the boundary of an elastic isotropic semi-plane. The material surface is modeled using the Steigmann-Ogden form of surface energy. The study of stationary points of the total elastic energy functional produces a boundary-value problem with non-classical boundary conditions. This 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. The numerical solution of the system of singular integral equations is obtained by expanding each unknown function into a series based on Chebyshev polynomials. The accuracy of the numerical procedure is studied, and various numerical examples for different values of the surface energy parameters are considered.