

# *Applied Math Seminar*

*University of Texas at Arlington - Department of Mathematics  
Proudly Presents:*

*Dr. Marcus Laurel*

University of Texas at Arlington

Friday, October 11, 2024

3:00pm – 4:00pm

305 Pickard Hall

## Boundary Problems In Rough Domains With Data in Weighted Morrey Spaces

Abstract: The goal of this talk is to present a brief introduction to the method of layer potentials for solving boundary value problems on rough domains. Specifically, we work with the class of weakly elliptic, second-order, homogenous, constant (complex) coefficient systems in Euclidean space. We use singular integrals of layer potential type, which themselves can be defined on the class of uniformly rectifiable sets, the geometric measure theoretic sharp analogue of Lipschitz images. This requires a Calderón-Zygmund theory that works in such rough geometries as well as on the function spaces we have in mind. Specifically, we consider boundary problems where the boundary datum is arbitrarily chosen from a Muckenhoupt-weighted Morrey space (an offshoot of the scale of Muckenhoupt-weighted Lebesgue spaces), in which integrals over balls are bounded by a uniform constant multiplied by a specific power of the radii of the balls. We will see the delicate interplay between harmonic analysis, functional analysis, and geometry that leads to a well-posedness result for the Dirichlet Problem. This is joint work with Professor Marius Mitrea (Baylor University).

Short Bio: Dr. Marcus Laurel received his Ph.D. in mathematics in 2024 from Baylor University under the guidance of Professor Marius Mitrea. He works on the confluence of geometry, harmonic analysis, and PDE. His interests lie in layer potential methods to solve boundary value problems for elliptic systems, as well as function space theory in rough geometric settings. He, with Prof. Mitrea, recently published a book titled *Weighted Morrey Spaces: Calderón-Zygmund Theory and Boundary Problem*. Currently, Dr. Laurel is an assistant professor of instruction at UT Arlington.

*Refreshments before the talk and socializing following the talk*

<http://www.uta.edu/math/seminars>