Title: One-and-half difference sets

Abstract: Combinatorial design theory has not only a deep respected and advanced mathematical heritage but also has produced genuine new applications that attract many engineers. Designs find applications in signal processing, dealing with radar problems, error-correction codes, optical orthogonal codes and image processing. Difference sets method play a central role in the study of designs, error-correction codes and binary sequences.

A \((v, k, \lambda)\)-difference set is a subset \(S\) of size \(k\) of a group \(G\) of order \(v\) such that every nonidentity element of \(G\) can be expressed as a difference \(d_1 - d_2\) of elements of \(S\) in exactly \(\lambda\) ways.

In this talk, we will introduce a generalization of \((v, k, \lambda)\)-difference sets. This new method produces a symmetric \(1\frac{1}{2}\)-design whose automorphism group has a subgroup that is transitive on blocks and points of the incidence structure. We will also provide preliminary results concerning \(1\frac{1}{2}\)-difference sets and the group rings and characters.