Cheryl Grood, Johannes Harmse, Leslie Hogben, Thomas J. Hunter, Bonnie Jacob, Andrew Klimas and Sharon McCathern* (smccathern@apu.edu). The minimum rank of symmetric zero-diagonal matrices associated with a graph.

Associated with any simple graph $G$ is a family of symmetric matrices with the same zero-nonzero pattern as the adjacency matrix of $G$. The minimum rank of the matrices in this family is known as the minimum zero-diagonal rank of $G$ and denoted $mr_0(G)$.

In this talk, we characterize all connected graphs $G$ with low ($mr_0(G) \leq 3$) and high ($mr_0(G) = |V(G)|$) minimum zero-diagonal ranks, and we describe the connection between the ranks of matrices associated with $G$ and the generalized cycles that are subgraphs of $G$. The existence of a unique spanning generalized cycle (also known as a unique perfect $[1, 2]$-factor) of $G$ is equivalent to $mr_0(G) = |V(G)|$, and we give an algorithm for determining whether a given graph has a unique spanning generalized cycle. We also discuss the maximum zero-diagonal rank of a graph, as well as the realizable zero-diagonal ranks between minimum and maximum for a given graph. (Received September 11, 2014)