Robert Shrock (SUNY Stony Brook):
Friday, June 11th, 11:15-12:00 EDT.

Title: The Potts-Tutte Polynomial and Some Connections between Graph Theory and Statistical Mechanics.

Abstract: We discuss the Potts model partition function $Z(G, q, v)$ in statistical physics and the equivalent Tutte polynomial $T(G, x, y)$ in graph theory, where G is a graph, $x = 1+(q/v)$, and $y = v+1$. In the physical context, q is the number of possible values of a dynamical variable defined on each vertex of G and v is a temperature-dependent variable. This equivalence is a very fruitful link between physics and mathematics. A special case of particular interest is the zero-temperature Potts antiferromagnet, $Z(G, q, -1)$, which is equal to $P(G, q)$, the chromatic polynomial of G, which counts the number of ways of assigning q colors to the vertices of G such that no two adjacent vertices have the same color. Specific topics discussed include zeros of $Z(G, q, v)$ in the complex q and v planes for various G; their limiting behavior as the number of vertices of G goes to infinity; results with S.-C. Chang and R. Roeder on the diamond hierarchical lattice; exponential growth constants for spanning forests; and percolation. Some open problems and areas for further research are noted.