SPEAKER:

Yilun Wu, Brown University

TITLE:

Steady State of Rotating Stars and Galaxies

ABSTRACT:
The equilibrium shape and density distribution of rotating fluid under self-gravitation is a classical problem in mathematical physics. Early efforts in and before the nineteenth century discovered ellipsoidal shapes with constant density. In the twentieth century, major progress was made by studying steady rotating solutions to the compressible Euler-Poisson equations. Two methods of constructing solutions have been used. Assuming a polytropic equation of state $p = \rho^\gamma$, a variational method, pioneered by the work of Auchmuty and Beals, proves existence of solutions if $\gamma > \frac{4}{3}$. On the other hand, we present in this talk a perturbative method that establishes specially structured solutions for $\gamma > \frac{6}{5}$. The method is built upon an old work of Lichtenstein. We also examine analogous results for the Vlasov-Poisson equations and for magnetic stars, and other extensions.