## APPLIED AND NUMERICAL ANALYSIS SEMINAR

Thursday April 14 Period 9

Speaker: Huanhuan Yang | Shantou University

Title: Stabilized SAV ensemble algorithms for parameterized flow problems

**Abstract:** Computing a flow system a number of times with different samples of flow parameters is a common practice in many uncertainty quantification (UQ) applications, which can be prohibitively expensive for complex nonlinear flow problems. This talk presents two second order, stabilized, scalar auxiliary variable (SAV) ensemble algorithms for fast computation of the Navier-Stokes flow ensembles. The proposed ensemble algorithms are based on the ensemble timestepping idea which makes use of a quantity called ensemble mean to construct a common coefficient matrix for all realizations at the same time step after spatial discretization. The adoption of a recently developed SAV approach that treats the nonlinear term explicitly results in a constant shared coefficient matrix among all realizations at different time steps, which further cuts down the computational cost. The exiting SAV approach for the Navier-Stokes equations for a single realization has very low accuracy that compromises its stability in our initial numerical investigations for several commonly tested benchmark flow problems. We address this issue by adding a stabilization term in each algorithm. For a single realization, both algorithms are unconditionally stable and have better accuracy than existing SAV methods.