**Title: Large Eddy Simulation Reduced Order Models**

**Speaker: Traian Iliescu (Virginia Tech)**

**Abstract:** In this talk, we present reduced order models (ROMs) for turbulent flows, which are constructed by using ideas from large eddy simulation (LES) and variational multiscale (VMS) methods. First, we give a general introduction to reduced order modeling and emphasize the connection to classical Galerkin methods (e.g., the finite element method) and the central role played by data. Then, we describe the closure problem, which represents one of the main obstacles in the development of ROMs for realistic, turbulent flows. To tackle the ROM closure problem, we use ROM spatial filters (e.g., the ROM projection and the ROM differential filter) and build new LES-ROMs that capture the large scale ROM features and model the interaction between these large scales and the small scale ROM features. Finally, we present results for these LES-ROMs in the numerical simulation of under-resolved engineering flows (e.g., flow past a cylinder and turbulent channel flow) and the quasi-geostrophic equations (which model the large scale ocean circulation).