1086-65-2642 **John A. Evans*** (evans@ices.utexas.edu) and **Thomas J. R. Hughes**. *Isogeometric Discrete Differential Forms with Application to Viscous Fluid Flow.*

In this talk, we will discuss a new class of discrete differential forms that is motivated by the recent emergence of isogeometric analysis. The cornerstone of this technology is the definition of spline spaces that constitute a discrete de Rham complex and associated commuting projection operators. Then, following the isogeometric paradigm, these spaces and operators are mapped onto NURBS- and T-spline-based geometries. Isogeometric discrete differential forms can be immediately applied to problem classes where the existence of a discrete de Rham diagram is a key ingredient for stability. For example, they can be used to obtain correct approximation of Maxwell eigenvalues. Moreover, as a result of their high levels of smoothness, isogeometric discrete differential forms can be applied to problem classes characterized by enhanced regularity. Namely, they can be directly utilized in the Galerkin solution of viscous flow problems using primitive variables. In the context of incompressible flows, this results in discrete velocity fields which are point-wise divergence-free. We will discuss both the construction of isogeometric discrete differential forms and their various mathematical properties as well as their application to the Brinkman and incompressible Navier-Stokes equations. (Received September 25, 2012)