1154-65-760 **Brian E. Moore*** (brian.moore@ucf.edu). *Structure-Preserving Exponential Integrators with Applications for Damped-Driven NLS.*

Many nonlinear PDEs have invariants or conservative properties (such as energy, momentum, mass, etc.) which can be preserved in numerical simulations by various schemes. In the presence of driving forces or damping terms those properties are altered, so that numerical preservation of the properties is more challenging. For cases in which the forcing and/or damping is linear with time-dependent coefficients, the properties often satisfy a linear differential equation and can be exactly preserved through discretization using exponential integrators. This talk presents a general framework for constructing methods that exactly preserve dynamic changes in a number of properties (energy, momentum, mass, etc.) which are effected by damping and/or driving forces. The resulting exponential methods are generalizations of other commonly used methods, such as Runge-Kutta, discrete gradient, finite difference, and collocation methods. To demonstrate their effectiveness, the methods are applied to several variations of damped-driven Nonlinear Schrödinger equations. In many cases, higher accuracy and efficiency are both observed in structure-preserving algorithms when they are compared to other standard schemes. (Received September 10, 2019)