**Giti Khodaparast, Physics Department, Virginia Tech, Email: khoda@vt.edu**

## Probe and Control of Coherent States in Multi-Functional Materials

Intense laser pulses can generate carriers, spins, phonons, and magnons ***far from equilibrium states***. Information about the dynamical behavior of these nonequilibrium states can be elucidated by: **1)** the electronic structure, **2)** carrier scattering and relaxation mechanisms, including carrier-phonon and carrier-carrier scattering, **3)** spin and magnetization dynamics, and **4)** dynamical many-body interactions. For example, coherent acoustic phonons which are ultrasonic strain pulses can result in a broad optical spectrum from GHz up to THz. The possibility of manipulating Coherent Phonons (CP) could lead to develop new techniques such acoustic imaging as well as better understanding and control of electronic and optical properties in devices. Exploring the interaction of CP with carriers, magnetic impurities, and photons can open new prospective of phononics on nanoscale. For example, the manipulation of spins in semiconductors without the application of magnetic fields opens the door to the next generation of devices, where the electronic computation and magnetic memory can be performed on the same chip. In this talk, I will present several time resolved studies including CP generation and control in multifunctional materials such as ferromagnetic semiconductors and mutliferroics.

**Short Bio:**

Professor Giti Khodaparast research activities at Virginia Tech have been focused to utilize and enhance the importance and power of magneto-optical spectroscopy to explore quantum coherence, correlations, and many-body effects in several materials systems that can play important roles in developing concepts for the next generation of devices or shed lights on the underlying interactions at the nanoscale. In addition, she has established strong national and international collaborations with large research facilities including the National High Magnetic Field Laboratory in Florida, and the Megagauss Laboratory in Kashiwa, Japan. She is the recipient of both the NSF CAREER and the AFOSR young investigator awards.