The main topic of this presentation will focus on fundamental and applied aspects of development of nanostructured reactive nanosystems and fabrication advanced nano-patterning devices for sustainable energy, national security, environmental protection and health care. I will present novel nanoenergetic systems that have a potential to enable a more concentrated energy release and can potentially create the framework for transformative research and development of energetic materials for a wide variety aerospace and military applications. Recent advances in the integration of nanoenergetic component into micro-electro-mechanical systems (MEMs) for fabrication of “nanoenergetics-on-a-chip” devices will be highlighted. The experimental results of manufacturing various nano tailored devices such as polymer-ceramic power harvesting systems, hard and soft magnetic components, multiferroics, capacitors, superconductors, photocatalysts, thermosensitive MRI contrast agents for drug delivery and cancer hyperthermia will be presented. Finally, I will describe development of novel Nanoscale Engineering Concentration program for undergraduate students at UTB. The curriculum is designed as a fully integrated program across the Science, Mathematics, and Technology rather than a set of electives on nanotechnology related topics.