College of Engineering Seminar
Announcement
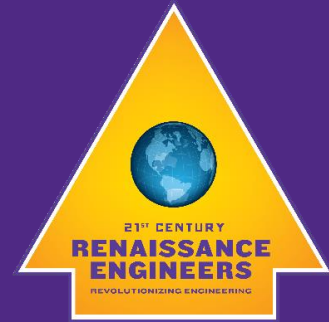
"Qualification Issues and Research Opportunities for Laser/Metal-Based Additive Manufacturing"
Presented by Duckbong Kim

Abstract Due to uncertainty of the complexity and variations in additive manufacturing (AM) processes, qualification is a critical issue for the manufacturing of parts in an efficient and robust way. The uncertainty deteriorates the process's repeatability and a part's reproducibility. It is reported that complete qualification of new materials and manufacturing processes for an air vehicle structure often requires thousands of individual tests, costs millions of dollars, and takes five to fifteen years to complete. To address these issues, many research efforts are underway. They can be categorized into 1) predictive modeling and simulation for physical understanding, 2) optimal process planning, 3 process-structure-property-performance relationships, 4) in-situ control, and 5) non-destructive evaluation. Among them, we focus on the predictive modeling and simulation for process-structure-property-performance relationships. The use of commercially available AM machines is still based on hand-tuned parameters. To help automate these selections, researchers are developing predictive models. However, predictive models include a set of highly complex physical models, high-order empirical models, or hybrid models, which require considerable experimental and computational costs. To address this issue, surrogate models are being created by changing high-order models into low-order approximation models. The surrogate model can improve existing knowledge and predictive models with robust decision-support. In this seminar, a framework of integrated predictive models and simulation for process-structure-property-performance relationships is presented. The current technical limitations and research opportunities for part qualification will also be discussed.

About the Speaker Dr. **Duck Bong Kim** is an assistant professor at the department of Manufacturing and Engineering Technology at Tennessee Technological University. He had been working as a research associate at the National Institute of Standards and Technology (NIST), Maryland, USA (from Oct., 2011 to Jul., 2016). Dr. Kim was involved in two projects at the NIST: "Systems Integration for Additive Manufacturing" and "Modeling Methodology for Smart Manufacturing Systems". With a PhD and MS in School of Information and Mechatronics from Gwangju Institute of Science and Technology (GIST), Korea, Dr. Kim is a cross-disciplinary research scientist with knowledge and experience in advanced design and manufacturing engineering: additive manufacturing (3D Printing), sustainable manufacturing, smart manufacturing, data analytics, and operations research.

November 17, 2016

Time: 4:30-5:30

Location: Prescott 225