UCONN | COLLEGE OF ENGINEERING
SCHOOL OF MECHANICAL, AEROSPACE AND MANUFACTURING ENGINEERING

**SoMAM Fall 2024 Seminar Series**
www.engr.uconn.edu

Friday, November 22 • 2:30 PM

PWEB 175

## Nanotechnology-enabled Manufacturing Processes

Dr. Hongseok Choi
Associate Professor
Department of Mechanical Engineering
Clemson University, Clemson, SC

**Abstract:** The advances in technology and intelligent components, driving innovation in engineering systems or processes, enable expectations to meet the growing demand for enhanced performance and a deeper understanding of mechanisms in a range of applications. While research activities in nanotechnology have exploded over the past decades, the infusion of nanotechnology into practical engineering systems or processes, especially manufacturing processes, has been limited due to the intricate barriers in various manufacturing processes. Appropriate integration of nanodevices into manufacturing processes is crucial for retaining the advanced functionality and performance of the devices in harsh environments. Furthermore, scale-up production of functional materials with uniform incorporation of nanoelements, such as nanoparticles, nanotubes, nanofibers, nanorods, and so on, is essential to leverage the distinctive physical, chemical, and mechanical properties of nanoelements for a wide range of industrial applications. This talk will present two aspects of nanotechnology-enabled manufacturing processes: nanodevice-aided manufacturing and scalable manufacturing of functional materials with nanoelements. In-situ monitoring of several manufacturing processes, particularly friction element welding, an advanced joining process for aluminum alloy to high strength steel, has been successfully achieved with embedded nano-thin-film sensors. The nano-thin-film sensors (embedded or not) would be powerful tools for in-situ sensing at critical locations, thus advancing fundamental understanding of manufacturing processes. In addition, a novel methodology for uniformly incorporating nanoelements into functional materials has been successfully developed for large-scale production of high-performance materials. This nanotechnology-enabled manufacturing process promises to be a transformative technology for further advancing manufacturing processes and economically producing high-performance functional materials for the energy and sustainability challenges facing today's manufacturing sectors.

**Biographical Sketch:** Professor Hongseok Choi is an associate professor in the Department of Mechanical Engineering at Clemson University, where he focuses on advanced materials processing, particularly in the realm of manufacturing with a strong emphasis on the interplay between material properties and fabrication methods. He has earned his Ph.D. in Mechanical Engineering from the University of Wisconsin-Madison (UW-Madison) in 2007 and worked as an assistant scientist in Nano-Engineered Materials Processing Center (NEMPC) until 2013, where his work laid the groundwork for various innovations in manufacturing and materials processing. Dr. Choi has authored numerous influential publications in the field, contributing significantly to the understanding and application of advanced manufacturing processes. He actively participates in interdisciplinary collaborations and serves on various committees for professional organizations, fostering growth and advancement within the fields of manufacturing and

materials science. He is a recipient of the SME Distinguished Faculty Advisor Award, demonstrating his dedication to fostering the next generation of engineers and reflecting his commitment to education and mentorship. Dr. Choi also engages in active collaboration with industry partners to translate research findings into practical applications, further solidifying the bridge between academia and industry in addressing current engineering challenges.

For additional information, please contact Prof. Farhad Imani at farhad.imani@uconn.edu or
Victoria Neel at victoria.neel@uconn.edu