JOINT SEMINAR SPONSORED BY ME512 and NIMSI:

NORTHWESTERN INITIATIVE FOR MANUFACTURING SCIENCE AND INNOVATION

Dr. Tahany El-Wardany

Raytheon Technologies Research Center
Technical Fellow of Advanced Manufacturing,
Aerothermal and Physical Sciences Department

Physics-Based Process Models Enabling Accelerated Manufacturing Readiness

Monday, October 26, 3-4 pm CDT

***ME512 students must join the seminar via the ME512 Canvas page for attendance registering.**

Zoom Link https://northwestern.zoom.us/j/92798535841

The adoption of new manufacturing technologies by industry is largely dictated by their readiness level. Development and adoption of digital and model-based means of representing engineering materials and fabrication methods, within a design environment, is essential to span the widening gap between materials engineering, fabrication methods, and design.

Computational modeling and simulation methods for materials and processes have been growing rapidly in the last 50 years. Commercial software codes became available to the industry for developing and optimizing a wide range of materials and manufacturing processes. Nearly every known conventional and advanced manufacturing process has been modeled to enable the understanding of the process physics and quantitative predictions of crystallographic texture evolution during deformation processes; and microstructure and defect occurrence during manufacturing and the corresponding mechanical properties. Experimentally verified process modeling always leads to the right-the-first-time design and manufacturing of a component.

This presentation will discuss aspects of the challenges and opportunities of physics-based modeling of conventional and advanced manufacturing methods that enable the reduction/elimination of tool failure and expensive part scrapping; customization and control of location-specific microstructure and mechanical properties within components; and development of hybrid manufacturing technologies to obtain custom material properties or enhance surface fatigue strength or fatigue life. Simulation tools have enabled the assessment and quantification of manufacturing processes leading to accelerated manufacturing readiness and saving of energy consumption and cost. In addition to discussing some of the future challenges for process simulation technology, this talk will also include increasing the range and fidelity of simulation tool capability and the need to increase the computation speed.

Please direct any questions to ME512@northwestern.edu or maegen.gregory@northwestern.edu