WPI MATERIALS SCIENCE & ENGINEERING

Wednesday September 19, 2018
12pm
Washburn shop #229

MTE Seminar Series

Evidence-based design of surface topographies and processes with basic metrology principles

Prof. Christopher Brown
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Abstract:
To specify surfaces for new products, or to use new manufacturing processes, product designers need to know functional correlations of the second kind, i.e., how topographies influence performance. Few of these are known well enough for evidence-based specifications. Historically, surface roughness specifications are based on experience with the product and processes. New processes, like additive, can be problematic. To design and specify processes, process designers and manufacturing engineers need to know functional correlations of the first kind, i.e., how topographies are influenced by processing. While more process-surface than surface-performance functional correlations are known, both kinds need to be determined experimentally. The strength of the functional correlations that can be found experimentally appears to depend on four basic principles: the scale and the geometric nature of the topographic characterizations, the statistics, and the quality of the measurements. Real surfaces usually have irregular topographies at sufficiently fine scales. Geometric properties can vary on irregular surfaces with position and with the scale. These principles for discovering functional correlations will be reviewed. Examples will be given in friction, adhesion, and fatigue applications, using area-scale and curvature-scale analyses and characterizations.

Unique opportunities and challenges in additive manufacturing

Prof. Sneha P. Narra
Assistant Professor
Mechanical Engineering

Abstract:
There is growing interest in using additive manufacturing (AM) for various alloy systems and industrial applications. This is due to the layer-wise build nature of AM which makes it extremely favorable for producing parts which are lightweight and have complex geometries. The resulting design flexibility makes AM particularly attractive to aerospace, biomedical, automobile, and energy industries and offers tremendous opportunities to new explore new applications and advance the state-of-the-art in various industries. At the same time, there are also challenges to be addressed to realize the full potential of AM. Some of these challenges are related to process development, qualification, and cost. In this talk, both opportunities and challenges are discussed with emphasis on the metal additive manufacturing processes that have garnered great interest in both industry and academia in the recent times. We will discuss our previous and ongoing efforts toward addressing these challenges along with discussing our approach to exploiting the opportunities offered by AM.