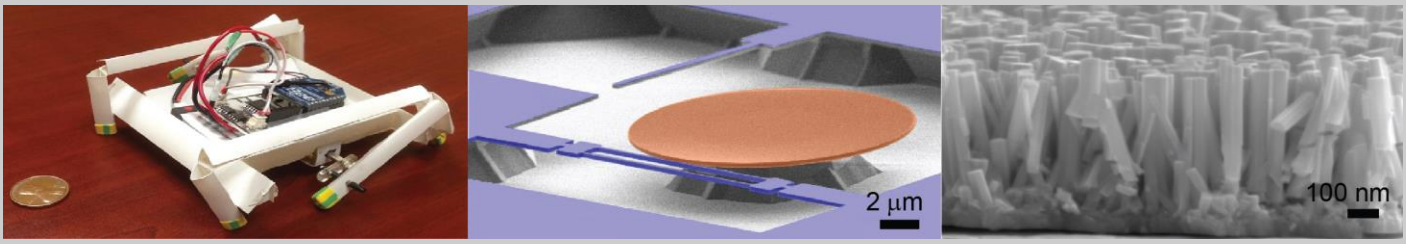
WPI MECHANICAL ENGINEERING



WPI ME Graduate Seminar Series 2019-2020

An Overview of Process Control in Metal Additive Manufacturing

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Worcester Polytechnic Institute

10:00-10:50 am, Wednesday, December 4
Higgins Labs 218

Additive manufacturing (AM), popularly known as 3D printing, is a layer-by-layer fabrication method. There are a variety of AM processes that are currently available in the market, and different types of materials covering polymers, metals, and ceramics can be used in these processes. Consequently, there is a growing interest in using additive manufacturing in aerospace, medical, automobile, and energy industries. This talk focuses on fusion-based metal additive manufacturing processes in which raw material (either in the form of a powder or a wire) is selectively melted and deposited using an energy source such as a laser beam or an electron beam or an electric arc.

AM not only offers the flexibility to fabricate components with complex geometries, but it also provides the opportunity to modify component properties by controlling the processing conditions. However, some of the major challenges associated with the AM process are (i) the presence of defects, such as porosity and surface irregularities, that can affect part properties; (ii) high variability in properties; and (iii) high costs of feedstock powders. On the other hand, so far, some of the less explored areas in AM research include the use of non-structural materials such as stimuli-responsive materials, and creation of novel structures that combine the best of the

About the Speaker

Dr. Narra received her M.S. degree in Computational Mechanics, M.S. and Ph.D. degree in Mechanical Engineering from Carnegie Mellon University (CMU). After receiving her Ph.D., she worked as a Postdoctoral Research Associate at the Next Manufacturing Center at CMU from 2017-2018. She joined WPI as an Assistant Professor in Fall 2018 in the department of Mechanical Engineering. Her primary research area is Additive Manufacturing with a focus on parameter development, process control concepts, and design and fabrication informed by a multi-scale understanding of the material behavior.

design, the materials, and the manufacturing worlds. This talk overviews the process control concepts as they relate to the above-mentioned challenges and opportunities. Relating to these possibilities, this talk will also present preliminary results to motivate (i) the fabrication using a magnetic shape memory alloy NiMnGa via laser powder bed fusion process, and (ii) the utilization of non-standard powders with irregular morphology in powder bed fusion AM that can potentially reduce the cost of the process.