



**Thursday, April 11<sup>th</sup>, 2019**  
**Marcus Building, Room 1116**

**10:00 AM - Advancements in Modeling, Sensing and Control for  
High-Resolution Additive Manufacturing**

Kira Barton, Associate Professor  
Department of Mechanical Engineering, University of Michigan

Additive manufacturing (AM) describes a class of processes that perform a layer-by-layer “bottom-up” fabrication approach as opposed to traditional top-down, subtractive fabrication such as milling and lathing. Printing-based AM, and in particular micro-scale AM ( $\mu$ -AM), has received significant attention in recent years as an enabling technology capable of revolutionizing the way we manufacture electronics, biosensors, and optics in this country. Meso-scale AM is capable of fabricating integrated features beyond what conventional machining can perform at this length scale. However,  $\mu$ -AM has yet to demonstrate the fabrication of complex 3D structures at the micro-scale that are not fabricable by traditional micromachining. Limiting this step change in manufacturing capabilities is the reliance of  $\mu$ -AM systems on a process monitoring, regulation, and quality control paradigm that is performed post-process and in an ad hoc manner. In this talk, we discuss some recent developments in process modeling, sensing, and control that aim to break this open-loop paradigm by providing the controls theoretic and process modeling knowledge to develop a robust closed-loop system for measurement and compensatory control.

**10:45 AM - Reinventing the Physical Layer to Create Interactive Sensing  
and Computing Systems**

Alanson Sample, Associate Professor  
Computer Science and Engineering, University of Michigan

Harnessing electromagnetic waves has changed how we live, work, and play. While the semiconductor industry has enabled faster, cheaper, and lower power wireless computing devices, there is the opportunity to use this underlying technology to re-examine the physical layer and explore novel sensing mechanisms, new wireless communication techniques, and innovative ways of harvesting energy and delivering power wirelessly. This talk presents an overview of ongoing projects which aims to create new interactive sensing experiences through innovations in hardware and software. Topics will include the use of signal processing techniques that turn battery-free, long-range RFID tags into minimalistic sensors, methods for turning everyday walls into touch interfaces, as well as backscatter sensor nodes that run perpetually off of harvested power.

## BIOGRAPHIES

**Kira Barton** is an Associate Professor and Miller Faculty Scholar in the Department of Mechanical Engineering at the University of Michigan. She received her B.Sc. in Mechanical Engineering from the University of Colorado at Boulder in 2001. She continued her education in mechanical engineering at the University of Illinois at Urbana-Champaign and completed her M.Sc. and Ph.D. degrees in 2006 and 2010, respectively. She held a postdoctoral research position at the University of Illinois from Fall 2010 until Fall 2011, at which point she joined the Mechanical Engineering Department at the University of Michigan at Ann Arbor. Kira conducts research in modeling, sensing, and control for applications in advanced manufacturing and robotics, with a specialization in Iterative Learning Control and micro-additive manufacturing. Kira is the recipient of an NSF CAREER Award in 2014, 2015 SME Outstanding Young Manufacturing Engineer Award, the 2015 University of Illinois, Department of Mechanical Science and Engineering Outstanding Young Alumni Award, the 2016 University of Michigan, Department of Mechanical Engineering Department Achievement Award, and the 2017 ASME Dynamic Systems and Control Young Investigator Award.

**Alanson Sample** joined the University of Michigan in September as an Associate Professor in Computer Science and Engineering. His research interests lie broadly in the areas of Human-Computer Interaction, wireless technology, and embedded systems. He has spent the majority of his career working in academic minded industry research labs. Most recently he was the Executive Lab Director of Disney Research in Los Angeles where he led researchers in creating new guest experiences through innovations in Robotics, Artificial Intelligence, Computer Vision and Human Computer Interaction. Prior to Disney, he was a Research Scientist at Intel Labs in Hillsboro working on energy harvesting for wearable and Internet of Things applications. He also held a postdoctoral research position in the Department of Computer Science and Engineering at the University of Washington. There, he worked with doctors from the Yale School of Medicine to develop wirelessly powered and fully implantable heart pumps. Alanson received his Ph.D. in Electrical Engineering in 2011 from the University of Washington. Throughout his graduate studies, he worked at Intel Research, Seattle on projects related to wireless power delivery using magnetically coupled resonance, energy harvesting as well as ubiquitous sensing and computing.

### ABOUT COSMOS

The COmputational Skins for Multifunctional Objects and Systems (COSMOS) center pursues the science and engineering necessary to create a world where physical objects are densely embedded with high performance, seamlessly networked, ambiently powered computational nodes that can process, store, and communicate data. Such a capability would redefine human-environment interactions by inextricably entangling 'everyday' objects and information technology. Realization of this vision is not possible within, and requires a fundamental rethink of, electronics manufacturing, circuit design, and human-computer interaction paradigms.