ABSTRACT: A “controlophobe” is someone who has a fear of control theory, and wants to stay as far away from it as possible. I consider myself to be one (albeit on the path to recovery, thanks to Mechatronics!). This presentation touch on how I became a controlophobe. It will then highlight three case studies (triumphs) at the Mechatronics and Sustainability Research Lab where control theory has been used to address challenges related to developing more sustainable advanced manufacturing machines. The first case study will demonstrate an elegant control theoretic framework for optimally locating passive vibration isolators to minimize unwanted vibration which plague ultra-precision manufacturing machines. The second case study will present an optimal transfer function relationship and how it has been used to realize the best positioning performance at very high energy efficiencies using a redundantly-actuated hybrid feed drive. The last case study will explain the concept of filtered basis functions and how it has been applied to tracking control of non-minimum phase and highly oscillatory systems that are common in manufacturing.

BIOGRAPHY: Chinedum Okwudire joined the mechanical engineering faculty at the University of Michigan in 2011. Prior to joining Michigan, he was the mechatronic systems optimization team leader at Mori Seiki, Ltd. based in Davis, CA. Chinedum received his Ph.D. degree in Mechanical Engineering from the University of British Columbia (UBC) in 2009. He has received a number of awards including the NSF CAREER award and the Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineering. He and his students have recently received best paper awards at the 2015 American Society for Precision Engineering and Dynamic Systems and Control Conferences. Chinedum teaches a very popular graduate course (ME 584: Advanced Mechatronics for Manufacturing), where he provides control theory “rehab” to other recovering controlophobes like himself by exposing them to Mechatronics.