Complex design problems represent one of the greatest challenges to engineering designers and engineering design tools. Complex design problems are characterized by hierarchical and lateral relationships between components, indirectly attributable causes and effects, minor system changes resulting in significant behavioral changes, interactions of simple parts leading to emergent behaviors, multiple time-, length-, and simulation-scales, non-quantitative metrics, and multiple stakeholders with unique value assessments. To address these complex design problems, engineers must increasingly collaborate with Computer-Aided Engineering (CAE) tools and surrogate approximations of the actual design problem to identify potentially optimal design solutions. Historically, engineering has applied increasingly sophisticated surrogate approximations to obtain tractable formulations to provide design solutions. The range of surrogate approximation techniques is quite vast, resulting in a fractured research community advocating methods each with their own advantages and disadvantages, yet no clear dominant approach. Within this talk, the development of several surrogate approximations is traced, the current state-of-the-art is described, and the future possibility of a unified surrogate approximation framework is presented. The implications of such a framework may have a wide-ranging effect upon the engineering design workflow of the future.

**About the speaker:** Dr. Cameron Turner holds a BSME from the University of Wyoming with a dual focus on Solid Mechanics and Thermofluids Sciences, an MSE in Mechanical Engineering from The University of Texas at Austin with a focus on Intelligent Robotics, and a Ph.D. in Engineering also from The University of Texas at Austin with a focus on Design and Optimization. He joined the faculty of the Colorado School of Mines in 2009, and served as the Director of the Engineering Design Program for the College of Engineering and Computational Sciences in 2012-3 after chairing the Senior Design Leadership Committee for three years. He has chaired the ASME’s Computer Aided Product and Process Design Committee and is currently a member of ASME’s Computers and Information in Engineering Division Executive Committee as well as a guest scientist at Los Alamos National Laboratory.