Experimental Measurements of Turbulent Junction Flow Using High Speed Stereo PIV and IR Thermography
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Time: 9:00 – 10:00 AM
Location: 358 Willard Blg.
Coffee and donuts will be provided

Abstract: Turbulent junction flow is commonly seen in various turbomachinery components, heat exchangers, submarine appendages, and wing-fuselage attachments, where the approaching boundary layer separates and rolls up into a coherent system of vortices upstream of a bluff body. The highly unsteady behavior of this flow causes high pressure fluctuations on the wall, and if the fluid temperature is different than the wall temperature, also causes high heat transfer. One of the signature features of these flows is a bimodal distribution of velocity around the vortex system. In this talk, the flow physics as well as heat transfer of the turbulent junction flow are investigated using PIV and IR measurements respectively. Among the three objectives of this talk, the first one is to demonstrate the unique experimental setup that captures temporally resolved turbulent flow-field measurements. The second objective is to analyze the dynamics of primary vortex for various Reynolds numbers. The final objective is to investigate the effect of the unsteady junction flow on the endwall heat transfer.

Bio: Syed S. Elahi is currently a Master’s student in Mechanical Engineering and is working with Dr. Stephen P. Lynch in the Experimental and Computational Convection Laboratory (ExCCL) at the Penn State University. His research focuses on understanding the unsteady flow behaviors and associated heat transfer in the turbulent junction flows, which are commonly observed in high temperature first-stage gas turbine blades as well as in aircraft heat exchangers.

Before coming to the Penn State University, he worked with Pratt & Whitney as a manufacturing engineer. While being in that position, his contribution mainly focused on modernizing the assembly floor operation guidelines to meet the ever increasing demands for PurePower Geared Turbofan compressor blades. During his undergraduate years in the University of Maryland, he also participated in the summer internship programs at the National Institute of Standards and Technology (NIST). At NIST, he contributed by writing a computer code in Engineering Equation Solver (EES) platform. This code then facilitated the efforts made by the Energy and Environment Division at NIST to standardize both current and future Air-conditioning units in the U.S.