Film cooling will be investigated on a flat plate both numerically and experimentally. Conical shaped film hole is investigated extensively and contribute to the current literature data, which is extremely rare in the open public domain. Both configuration of film hole with and without sitting on a trench are investigated in detail. Design of experiment technique was performed to find an optimum combination of both geometrical and fluid parameters to achieve the best film cooling performance. From this part of the study, it is showing that film cooling performance can be enhanced up to 250% with the trenched film cooling versus non-trenched case provided same amount coolant usage. The purpose of the second part of this study is to examine the interaction of the secondary flow inside a 3D cascade and the injected film cooling jets, which is employed on the first stage of the aircraft gas turbine engine to protect the curvilinear (annular) endwall platform. Again, this also conducted both experimentally and numerically, and validation shows good agreement with literature. It can be concluded that with an appropriate film coolant to mainstream blowing ratio, one can not only achieve a best film cooling effectiveness on the downstream endwall but also maintain almost the same aerodynamic loss as in the un-cooled baseline case.

Major: Thermal Fluid

Educational Career:
Bachelor’s of Mechanical Engineering, BS, 2006, University of South Florida
Master’s of Mechanical Engineering, MS, 2006, University of South Florida

Committee in Charge:
Jayanta Kapat, Chair, MMAE Department, UCF
Reda Mankbadi, Co-Chair, College of Engineering, ERAU
Jihua Gou, MMAE Department, UCF
Marcel Ilie, MMAE Department, UCF
Bijay Sultanian, MMAE Department, UCF
Ratan Guha, EECS Department, UCF
Son Ho, MMAE Department, UCF

Approved for distribution by Jayanta Kapat, Committee Chair, on October 3, 2010.

The public is welcome to attend.