

# DEPARTMENT OF MECHANICAL ENGINEERING

## WILLIAM MAXWELL REED SEMINAR SERIES

### “Multiphysics Computations of Non-Equilibrium and Non-Continuum Flows”

Savio Poovathingal, Ph.D.

University of Michigan

**Abstract:** The reliable prediction of system response exposed to non-equilibrium and non-continuum flows is crucial to solving grand challenges in space exploration, national defense, and energy. Creative application of high-fidelity multi-physics tools that span several lengths and timescales is essential because the macroscale behavior is driven by competing microscale and atomistic scale physics. Direct simulation Monte Carlo (DSMC) is a particle-based method ideally suited to simulate flows in non-equilibrium and non-continuum conditions. My talk will discuss the application of DSMC to help improve our understanding of the effect of material microstructure on the macroscale oxidation of carbon composites. I will also discuss the development of a new state-of-the-art macroscale oxidation model from atomic scale information. The model provides important insights into the design of heat shield materials for high-speed cruise vehicles.

**Bio:** Savio Poovathingal received his Ph.D. in Aerospace Engineering at the University of Minnesota. He is currently a research fellow in the Nonequilibrium Gas and Plasma Dynamics Laboratory in Aerospace Engineering, and the DOE Plasma Science Center at the University of Michigan. Prior to joining Michigan, he was a post-doctoral scholar in the Molecular Beam Experiments Laboratory in the Department of Chemistry at Montana State University. He is a recipient of the John and Jane Dunning Copper Fellowship, and the Doctoral Dissertation Fellowship from the University of Minnesota. His interests span aerothermodynamics, fluid-material interactions, non-equilibrium kinetics, and numerical development for fluid dynamics.

**Date:** Friday, Feb. 8<sup>th</sup>

**Place:** CB 118

**Time:** 3PM

**Contact:** Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments  
Attendance open to all interested persons