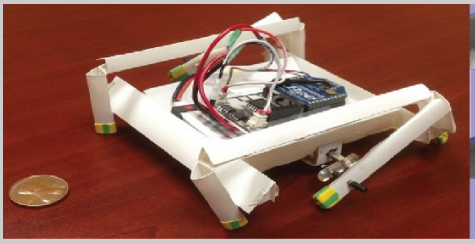
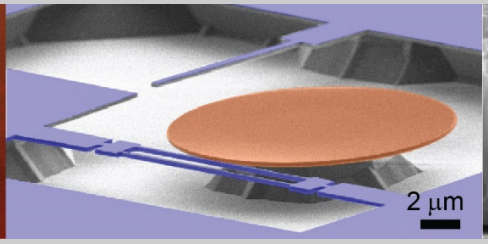
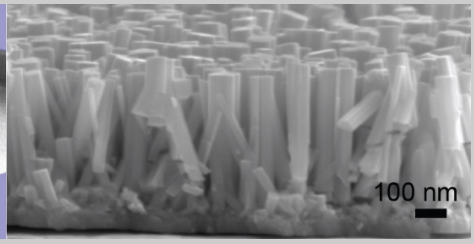
WPI MECHANICAL ENGINEERING







WPI ME Graduate Seminar Series 2019-2020

Dynamics of Premixed Flames and Other Burning Problems

Jagannath Jayachandran
Assistant Professor, Aerospace Engineering
Worcester Polytechnic Institute

10:00-10:50 am, Wednesday, February 19
Higgins Labs 218

Premixed flames or deflagrations are waves that propagate through a mixture in which the fuel and oxidizer are mixed at the molecular level. The dynamics of these fronts are controlled by the rate of diffusion processes (species and energy) and chemical reactions. The nature of fluid flow and the physico-chemical properties of the fuel can modify the rates of transport processes and hence the dynamics of these flames. In some cases, cellular instabilities can develop on the flame surface, which in turn leads to large rates of flame acceleration.

In this talk, I will outline the basic mechanism of flame propagation and how its dynamics is affected by differences in the rate of species and heat transfer. Then, we will examine flames of large hydrocarbons (like most practical fuels) using detailed numerical simulations and show that well-established theories fail to account for the observed behavior and other details need to be taken into account when developing reduced order models. In addition, I will also discuss the current energy landscape, why it is important to study combustion, and a couple of problems my group is working on.

About the Speaker

Jagannath Jayachandran joined WPI during the fall of 2018 as an Assistant Professor in Aerospace Engineering. He completed his Ph.D. and post-doctoral tenure at the University of Southern California. His research interests include aerodynamic and kinetic processes in flames, physical and chemical processes at extreme thermodynamic conditions, high-speed air-breathing propulsion, rocket propulsion, and detailed modeling of reacting flows.