UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Aerospace Engineering
THE GRAINGER COLLEGE OF ENGINEERING

AE 590 Graduate Seminar Series

Monday, March 1 | 4pm CST

Title: Shock-Particle Interaction and Explosive Dispersal of Particles

Speaker: Dr. Sivaramakrishnan Balachandar
Chairman and William F. Powers Professor of Mechanical and Aerospace Engineering
University of Florida

Registration:
To join this seminar online you must register via Zoom:
https://illinois.zoom.us/meeting/register/tZMpce2rrTkrHdKcq6k_ups2VDXoVf9-mOuk
Meeting ID: 874 6433 2176

Students attending in-person do not need to register.

Abstract:
Shock-particle interaction is fundamental to explosive dispersal of particles, as it occurs in many natural and human-made systems. Euler-Lagrange point-particle (EL-PP) technique has been increasingly employed for solving such complex flows. Since flow around the individual particles is not resolved, the accuracy of the technique depends on the fidelity of the force law used for representing the fluid-particle momentum exchange that occurs at the microscale. The talk will take a reductionist approach and address the following sequence of increasingly more complex problems: (i) We will first discuss the generalized Faxen form of the force law, which allows accurate accounting of the coupling between the flow and an isolated particle even under complex conditions, where the length and time scales of the flow are comparable to those of the particle (such as during shock-particle interaction). (ii) We will then consider shock interaction over a structured and random array of particles. Here we will focus on the effects of particle-particle interaction. (iii) Finally, we will address the physics of explosive dispersal of particles.

Bio:
1989. “Bala” Balachandar got his undergraduate degree in Mechanical Engineering at the Indian Institute of Technology, Madras in 1983 and his MS and PhD in Applied Mathematics and Engineering at Brown University in 1985 and 1989. From 1990 to 2005 he was at the University of Illinois, Urbana-Champaign, in the Department of Theoretical and Applied Mechanics. From 2005 to 2011 he served as the Chairman of the Department of Mechanical and Aerospace Engineering at the University of Florida. Currently, he is a distinguished professor at the University of Florida. He is the William F. Powers Professor of Mechanical & Aerospace Engineering and the Director of College of Engineering Institute for Computational Engineering.

Bala received the Francois Naftali Frenkiel Award from the American Physical Society (APS) Division of Fluid Dynamics (DFD) in 1996 and the Arnold O. Beckman Award and the University Scholar Award from University of Illinois. He is a Fellow of ASME and the American Physical Society Division of Fluid Dynamics. He was the recipient of ASME Freeman Fellow in 2017 and the Gad Hetsroni Senior Award from the International Conference on Multiphase Flow in 2019. In 2020 he received the Outstanding Alumnus Award from the Indian Institute of Technology, Madras and the Doctoral Dissertation Advisor/Mentor of the year award at the University of Florida. He is currently the editor-in-chief of the International Journal of Multiphase Flow and an associate editor of the Theoretical and Computational Fluid Dynamics.