



## FMRC Fluid Mechanics Research Seminar Series

### Computational Modeling of Soluble Surfactant and Viscoelasticity in Multiphase Flows

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İTÜ Uçak ve Uzay Bilimleri Fakültesi, TAV Konferans Salonu

**Abstract:** Microfluidics typically refers to precise control and manipulation of fluids that are geometrically constrained to a small, typically between 100 nm-100 microns, scale. It is a fast growing field being driven by new technological applications in the medical, materials, biological and chemical sciences. With the rapid advances in micro-fabrication, devices have shrunk, and it is now possible to “print” miniature networks of channels with cross-sections typically on the order of tens of micrometers across – the width of a human hair. The ultimate goal is to create automated chemical laboratories called **lab-on-a-chip** that would fit on the palm of one’s hand. As the scale decreases, the effects driving and dominating fluid motion change radically. At micron scales, fluid flows are primarily dominated by surface tension and viscous forces. The physics of microfluidic systems are well-described by continuum theory and flow is almost always laminar. Therefore computational fluid dynamics (CFD) can be used as a design tool and has a potential to replace many of the laboratory experiments in microfluidics systems. In this talk, I’ll describe a front-tracking method developed for computations of interfacial flows encountered or inspired by bio/microfluidics applications. Special emphasis will be placed on treatment of soluble surfactants and visco-elastic effects. Although the Reynolds number is usually low in microfluidics, the numerical method is general and applicable to a wide range of Reynolds numbers including turbulent bubbly flows. Sample simulations will also be presented for high Reynolds number flows.

**Biography:** Dr. Muradoglu is an associate professor in Mechanical Engineering at Koc University. He received BS degree from Istanbul Technical University (ITU) in Aeronautical Engineering in 1992, and MS and PhD degrees both from Cornell University in 1997 and 2000, respectively. He also worked as a postdoc at Cornell for about 18 months before joining Koc University faculty in 2001 as an assistant professor. He spent the summers of 2004-2007 in SEAS at Harvard University as a visiting scholar and worked on microfluidics. He had visiting positions at the University of Notre Dame and Princeton Universities during 2013-2014 academic year. Dr. Muradoglu is the recipient of Turkish Academy of Sciences outstanding young scientist award (TUBA-GEBIP) (2009) and encouragement awards by Mustafa Parlar Vakfi (ODTU) (2009) and FABED (ITU) (2009) and The Scientific and Technical Research Council of Turkey (TUBITAK) (2010).

