

**Topic:**

Fundamentals and Applications of Micro and Nano-Fluidics

Expected background of participants:

Atleast B. Sc. in mechanical engineering or other related engineering fields (chemical engineering, aerospace engineering, and biomechanics.)

Objectives:

- 1) To understand the physical behaviour of fluids at the micron and nanometer.
- 2) To introduce fluid dynamics in microscopic and nano-scale domains.
- 3) To introduce micro/nano-electro-mechanical-systems and micro/nano-fluidic devices for various engineering and bio-applications.

Short summary:

Scientists from almost all traditional engineering and science disciplines have begun pursuing micro- & nano-fluidics research, making it a truly multidisciplinary field representative of the new economy of the twenty-first century. Life scientists and chemists also find in microfluidics novel, useful tools. Micro fluidics tools allow them to explore new effects not possible in traditional devices. These new effects, new chemical reactions, and new microinstruments lead to new applications in chemistry and bioengineering. These reasons the enormous interest of research disciplines in micro- & nano-fluidics. In response to the commercial potential and better funding environments, micro- and nano-fluidics quickly attracted the interest of the scientific community. Fluid mechanics researchers are interested in the new fluids phenomena possible at the micro scale. The proposed tutorial will introduce the fundamentals of intermolecular forces and proceed to a consideration of where continuum assumptions are valid and where they are not. Scaling phenomena will then be discussed, i.e. the importance of surface tension and dominance of drag, in continuous flows. Subsequently, the breakdown of continuum behavior will then be discussed and the utility of computational simulations outlined. A short introduction to electro-kinetics will be provided. Then experimental techniques suitable for micro/nano flows will be presented. The proposed tutorial will encompass issues ranging from nanotechnology to microsystems technologies (MEMS).