# TUAT Fluid Dynamics Seminar

## Solid surface energy in elasto-capillary systems

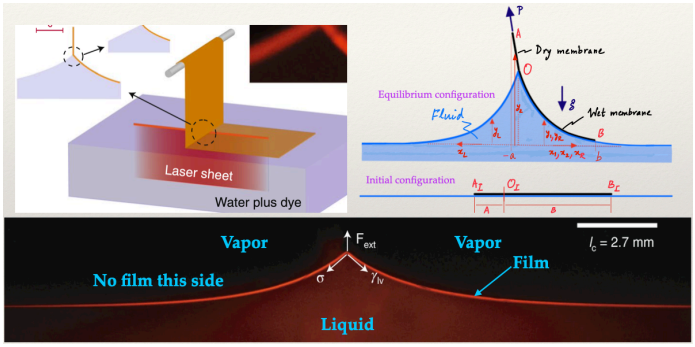

Lecturer:

Dr. Ishan Sharma


Date: Thursday, 14th March, 2024
Time: 15:00 - 16:00
Place: Building 6 - Room201


### Abstract

It is expected that in elastocapillary systems the deformation of soft materials and/or slender structures abutting the fluid interface will be nontrivially affected by the surface energies at the interfaces between the solid and fluid/air. This makes understanding the role of solid surface energies practically important. While authoritative thermodynamic treatments from the time of Gibbs make the case of solid surface energy clear, debate still persists about how to experimentally measure these surface energies at the solid's various interfaces, how to incorporate them in the mechanics of elastocapillary systems, and whether such interfacial energies will affect the solid structure's deformation and/or stress field. A recent experiment [Kumar et al. 2020, Nature Materials, vol. 19, pp. 690-693] is cited to claim that solid surface energies cannot affect thickness-averaged stress within membranes and, consequently, the membrane's deformation as a solid body is independent of its surface energies. I will discuss a framework in which solid surface energies may be included in elastocapillary systems in a systematic way, show how the internal stress field in the solid is modified by solid surface energies, and thus arrive at a consistent interpretation of experiments, such as those of Kumar et al.


### Biography

Ishan Sharma is a Professor with joint appointments in the Department of Mechanical Engineering and the Department of Space Science & Astronomy at the Indian Institute of Technology (IIT) Kanpur. He did his Ph. D. in Theoretical & Applied Mechanics from Cornell University (2004). He then spent 2 years at the Department of Applied Mathematics & Theoretical Physics (DAMTP) at Cambridge University, UK. He joined IIT Kanpur in 2006 where he has been since. He is interested in using mechanics to understand the physical processes that drive natural and engineering systems on Earth and in space.


Organized by: Prof.Y.Tagawa (tagawayo@cc.tuat.ac.jp)