MECHANICAL ENGINEERING STUDENT SEMINAR

Thursday, November 14, 2024, at 13:30, D. Dan and Betty Kahn Building, Room 217.
Online: http://technion.zoom.us/my/Israelg

Theoretical and experimental investigation of liquid film dynamics in a finite domain, with applications to microfabrication and space telescopes

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Optical elements require well-defined surface topography of high quality. The production of such smooth, curved surfaces, particularly at the microscale, is challenging for most traditional fabrication methods. Liquids, owing to their natural smoothness, are excellent candidates for creating such smooth topographies. In my research I use both theorical analysis and experiments to understand the dynamics of thin liquid films in finite domains, and explore approaches for their manipulation to achieve precise surface deformations.

In the first part of the seminar, I will present a combined theoretical and experimental study of thin liquid film deformations induced by dielectrophoretic forces from surface electrodes. I will also show how this approach can be used to create solid microstructures with desired topography. In the second part, I will focus on the importance of the boundary conditions on film dynamics and present an experimentally validated model for liquids in confined domains – the case which best represents applications such as actuators and adaptive optics, and yet was not addressed analytically to date. Finally, I will present the expansion of the model and its use in the context of the Fluidic Telescope Experiment – our collaboration with NASA which aims to create a 50 m liquid-based space telescope.