Technion-Israel Institute of Technology
Faculty of Mechanical Engineering

הטכניון-מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות במסגרת הדוקטורט, שתתקיים ביום ה' 2.11.2017 (י"ג בחשון, תשע"ח), בניין דן-קאהן, אודיטוריום 1 , 13:30.

מרצה: אריה טולצ'ינסקי

מנחה: פרופ"מ אמיר גת

על הנושא:

Dynamics of viscous thin films interacting with slender elastic media

The seminar will be given in Hebrew

להלן תקציר ההרצאה:

This talk will focus on the outcomes of my doctoral studies on the dynamics of viscous thin films bounded by elastic slender media. The talk is divided into four parts. In the 1st part of the talk I will present the study on the fluid-structure interaction occurring in and around frogs' toe pads, in the context of wet adhesion (Tulchinsky & Gat 2015 JFM). The frogs' toe pads are modeled via poroelastic mixture theory, and the flow around it by the lubrication approximation. Specifically, I focus on the relaxation dynamics of a toe pad initially compressed against a rigid, non-smooth surface. The viscous fluid, flowing from the lubrication region into the porous material, yields a negative pressure-field and thus effectively creates temporary adhesion.

The 2nd part of the talk will focus on the transient dynamics of a lubrication film contained in a narrow gap between a rigid surface and a parallel elastic plate. The elastic plate is deformed due to an externally applied time-varying pressure-field (Tulchinsky & Gat 2016 JFM). The analysis yields the pressure and deformation fields during and after application of external point forces. Furthermore, impact mitigation capabilities of such configurations are examined. The analysis reveals that order of magnitude reduction of liquid pressure compared with the external pressure may be realized.

In the 3rd part of the talk I will present results on the study of steady-state oscillations of parallel elastic sheets containing a thin liquid film. The upper sheet is excited by a traveling pressure wave and the bottom sheet may be supported by a linear elastic substrate. The analysis focuses on the effect of inertia (both solid and liquid) and the asymmetry of the elastic sheets. The analytical results exhibit the response dynamics of the configuration for a wide range of excitation parameters as well as reveal a new resonance frequency related to the interaction between parallel fluid flow and elastic transverse deformations.

The 4th part of the talk will focus on the study of the effect of solid compressibility and externally applied heat on the stability and dynamics of an elastic sheet position above a lubrication film. Heat is applied on the viscous thin film from its lower boundary, and is conducted to the upper elastic sheet. The solid-fluid interface and temperature distribution creates unique deformation patterns, and in some of the scenarios an instability arises. Moreover, it is shown that spatially and temporally varying external heat may be utilized to create desired actuations.

בברכה,

פרופ"א מתי סאס
מרכז הסמינרים