

## סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ה' 16.12.2021 (י"ב בטבת, תשפ"ב), בשעה 11:00 באודיטוריום 1, קומה 0, בבניין דן-קאהן.

מרצה: חוליאן לוינטון

מנחה: פרופ' דוד אילתה

על הנושא:

### **MODELING AND EXPERIMENTAL INVESTIGATION OF PIEZOELECTRIC ACTUATORS MADE FROM PMN-PT**

The seminar will be given in Hebrew

תקציר ההרצאה:

Piezoelectricity is a two-way coupling between mechanical stress or strain, and electrostatic field or flux. The direction of this coupling is determined by the orientation of poling in the material, and in most applications, this coupling may be considered as linear. Many piezoelectric actuators are made from PZT, which exhibits very strong piezoelectric coupling. In this research, we investigate the possibilities of using *PMN-PT* for producing micro-scale actuators for bending and twisting. The coupling coefficients of *PMN-PT* are more than twice as large as the related coefficients of PZT. However, *PMN-PT* has two unique properties that make this material challenging for actuators. First, *PMN-PT* exhibits some electrostriction response, where the deformation is related to the *square* of the electrostatic field, rather than the linear relation in piezoelectricity. In electrostriction the deformation is independent of the polarity of the field. Second, *PMN-PT* has a very low coercive field, which is the field at which the orientation of poling can be permanently modified by the applied field.

In this research we investigate, by modelling and experimental testing, three different types of response of *PMN-PT* bending unimorphs. These three different responses occur at increasing levels of a harmonic driving field. For low levels of field, the response is piezoelectric and linear. For higher fields the response is strongly affected by electrostriction. For field that are stronger still, where the field exceeds the coercive field, the poling of the *PMN-PT* actuators may flip. In our modelling and experiments, we show how the transition between the three types of response can affect the stability of *PMN-PT* bending micro actuators.

בברכה ,

פרופ' ח' אתי סאס

מרכז הסמינרים