**הטכניון – מכון טכנולוגי לישראל**
**הפקולטה להנדסת מכונות**

**TECHNION – Israel Institute of Technology**
**Faculty of Mechanical Engineering**

## SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 5.01.15 (י"ד בטבת, תשע"ה), בבניין דן-קאהן, קומה 0, באודיטוריום 1 בשעה 14:30.


**יוצא:**

**Dr. Shyamal Roy**

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Present Address: Post-doctoral Researcher, The Nanomechanics Simulations Laboratory, Department of Mechanical Engineering, Technion, Israel


**על הנושא:**

# Microscale Modeling of Multiple and Higher-Order Deformation Twinning


**להלן תקציר ההרצאה:**

Deformation twinning is a deformation mechanism displayed by most of the crystalline materials, such as Ti, Mg, and TWIP steels. It has a strong impact on the microstructure and the texture, due to grain refinement and an accompanying lattice reorientation and, hence, on the macroscopic response. A reliable prediction of the material response requires the understanding of the underlying physics of the microstructural evolution. The higher-order twinning phenomenon and multiple twin systems activation of hcp material (for example, Ti) are modeled on the grain scale by the minimum elastic strain energy approach. Two different transformations, one for the crystal orientation and another for a simple shear deformation, are introduced corresponding to each twin operation, which are necessary to model the higher-order twinning on continuum level. These enable us to elucidate the multiple twin system activation and the detwinning. The non-convex elastic strain energy and the stress-free placements have to be updated depending on the activated twin variant to incorporate the higher-order twinning. The mathematically formulated material modeling for the higher-order twinning is implemented for Ti by coding an user material subroutine (UMAT) for Abaqus.

The visco-elastic model predicts the compression twins {11-22} and the tensile twins {10-12} of hcp (Ti) material, under a deformation controlled test for a single crystal. It vaticinates the grain refinement in the single crystals by incorporating the crystal reorientation occurs because of twinning. The model estimates the threshold value of misorientation angle between two grains, below which the twin migration across the grain boundary occurs. It would be interesting to see the applicability of the model for multiple and higher-order twinning in other hcp materials, and the fine twins in the fcc materials.


בברכה,

*פרופ'/א אמיר ישי*
מרכז הסמינרים

**המארח**: פרופ"מ דן מרדכי