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, שתתקיים ביום ב' 13.02.17 (יז' בשבט, תשע"ז), בניין דן-קאהן, קומה 0, אודיטוריום 1 , 14:30.

יוצר: גיל יעקבי

מנחה: פרופ"מ יולי סטרוסבצקי

על הנושא:

Passive and semi-active mechanisms of irreversible energy flow in coupled Hertzian models

The seminar will be given in Hebrew

להלן תקציר ההרצאה:

Granular crystals, also known as nonlinear acoustic meta-material, are the assembly of discrete solid granular elements of various shapes, arranged in regular lattice structure. These elements are initially in contact and interact one with another through a nonlinear repulsive contact force (Hertzian contact law). In the past few decades, granular crystals attracted substantial attention for their unique dynamical properties of significant practical importance in addition to their simple fabrication. Granular metamaterials can be used in the various engineering problems such as shock mitigation, vibration absorption, vibration isolation and wave manipulation. In the present work, we study the two fundamental mechanisms of uni-directional energy transfer between the two coupled Hertzian oscillators and oscillatory chains in the passive and semi-active manner. In the first case corresponding to the passive mechanism, we consider the response of the two nonlinearly coupled, dissipative Hertzian chains. We demonstrated that under particular set of system parameters the model under consideration allows the inter-chain, irreversible transfer of nonlinear waves (spatially localized waves, spatially extended waves). In the case of the semi-active mechanism, we study the response of the two coupled Hertzian oscillators and oscillatory chains subject to the different dynamical states. The model under consideration assumes that the initially excited Hertzian chain is in the uncompressed state (usually referred to as an 'acoustic vacuum') while the coupled chain is given to the state of a strong, slowly varying compression. In the second part of the study we demonstrate the emergence of special regimes of irreversible energy flow governed by the compression rate. Using some basic asymptotical techniques (multi-scale analysis, averaging) we described both mechanisms analytically and predicted the special regions in the space of the system parameters corresponding to the formation of the aforementioned regimes of irreversible energy flow in coupled Hertzian chains. Theoretical predictions derived from the simplified asymptotical models are found to be in a good agreement with the results of the direct numerical simulations of the original systems.

בברכה,

פרופ"א שאול אלוני
מרכז הסמינרים