# SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 15.10.2018 (ו' בחשון, תשע"ט), בבניין דן קאהן, אודיטוריום 1, 14:30

**מרצה:**

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**על הנושא:**

## Quasicrystalline multilayered metamaterials: negative refraction and self-similarity of the Bloch-Floquet spectrum

The seminar will be given in English

**להלן תקציר ההרצאה:**

We investigate the problem of an antiplane wave obliquely incident at the interface between an elastic substrate and a laminate is investigated. The considered layered media possess a quasicrystalline structure, generated according to the Fibonacci substitution rules [1]. The substrate-laminate system is studied combining the transfer matrix method to the normal mode decomposition technique [2]. The diffraction angles associated with the transmitted modes are estimated by means of the space averaging procedure of the Poynting vector [3]. We show that, with respect to a periodic classical bilayer [4], on the one hand, beyond a certain frequency threshold, high order Fibonacci laminates can provide negative refraction for a wider range of angles of incidence, on the other, they allow negative wave refraction at lower frequencies.
Moreover, the performed numerical results illustrate that the Bloch-Floquet spectrum corresponding to this class of laminates has a self-similar character linked to the specialization of the Kohmoto's invariant, a function of the frequency that was recently studied by the authors for periodic one-dimensional quasicrystalline-generated waveguides [5]. This function is able to explain two types of scaling occurring in dispersion diagrams. The obtained results represent an important advancement towards the realisation of multilayered quasicrystalline metamaterials.

**References**

[1] Gei M. Waves in quasiperiodic structures: stop/pass band distribution and prestress effects, Int. J. Solids Struct., 47 (2010) 3067-3075.
[2] Srivastava A. and Willis J.R. Evanescent wave boundary layers in metamaterials and sidestepping
them through a variational approach, Proc. R. Soc. A, 473 (2017) 20160765.
[3] Willis J.R. Negative refraction in a laminate, J. Mech. Phys. Solids, 97 (2016) 10-18.
[4] Srivastava A. Metamaterial properties of periodic laminates, J. Mech. Phys. Solids, 96 (2016) 252-263.
[5] Morini L. and Gei M. Waves in one-dimensional quasicrystalline structures: dynamical trace mapping, scaling and self-similarity of the spectrum, J. Mech. Phys. Solids, 119 (2018) 83-103.
This work was done in collaboration with Y. Eyzat, M. Gei, geim@cardiff.ac.uk.

**מארח**: פרופ"מ גל שמואל

בברכה,

שפופ"א אתיו סאס
מרכז הסמינרים