



## SEMINAIRE EXCEPTIONNEL

(de 14 h à 15 h, salle Belledonne, IMEP-LaHC, Bât. BCAi, Minatec, ouvert à tous : enseignants, étudiants, chercheurs, administratifs, techniciens)

Mercredi 29 mars 2017

“Vibrational energy harvesting in bistable systems and structures”

by Prof. Grzegorz LITAK  
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**Abstract:** A common energy harvesting device uses a piezoelectric patch on a cantilever beam with a tip mass. The usual configuration exploits the linear resonance of the system; this works well for harmonic excitation and when the natural frequency is accurately tuned to the excitation frequency. Among various systems discussed, a cantilever beam with a tip mass that is mounted vertically and excited in the transverse direction at its base is considered. This device is highly non-linear with two potential wells for large tip masses, when the beam is buckled. The system dynamics may include multiple solutions and jumps between the potential wells, and these are exploited in the harvesting device. The electromechanical equations of motion for this system are developed, and its response for a range of parameters is investigated using phase portraits and bifurcation diagrams. The model is validated using an experimental device with three different tip masses, representing three interesting cases: a linear system; a low natural frequency, non-buckled beam; and a buckled beam. We examine the multiple solutions and associated power outputs.

*Grzegorz Litak completed his M.Sc. degree in physics at Maria Curie Skłodowska University (UMCS) in Lublin, Poland in 1988. Later, working on the effect of disorder on correlated and exotic superconductors, he received his Ph.D (1994) and D.Sc (2002) degrees from the same University. After defending his Ph.D thesis he moved to Lublin University of Technology where he is presently working as a full professor. From that time he also started his research on mechanical engineering, production engineering, and nonlinear dynamics. He focused on bifurcation theory, chaotic dynamics and nonlinear time series analysis. Recently, he was also involved in research on mechanical energy harvesting, focusing on frequency broadband effects. From 2016 prof. Litak works also at AGH University of Science and Technology. In the present time he is a visiting professor in LGEF INSA Lyon. G. Litak published over 250 papers including about 160 in international journals.*

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