Control for Green Mechatronics (GREEM)

INTERNATIONAL MASTER

A speciality of "Control & Robotics" of the French Ministry of Higher Education & research

www.greem-ubfc.fr ; www.ubfc.fr

Besançon France, December, 2018
Object: Information

To students: M2 GREEM
Course title: Energy Harvesting: global electrical interface
Time: Monday the 17th of December 2018, 10h – 18h,
Place: Room-215B, Building-B, UFR-ST, 16 route de Gray, 25000 Besançon

By: Dr Mickaël Lallart, Associate Professor, INSA Lyon, France
Bio: https://scholar.google.fr/citations?user=pORv57QAAAAJ&hl=fr

Dr. Mickaël Lallart was born in 1983. He graduated from Institut National des Sciences Appliquées de Lyon (INSA-Lyon), Lyon, France, in electrical engineering in 2006, and received his Ph.D. in electronics, electrotechnics, and automatics from the same university in 2008, where he worked for the Laboratoire de Génie Electrique et Ferroélectricité (LGEF). After completing a post-doctoral fellowship in the Center for Intelligent Material Systems and Structures (CIMSS) in Virginia Tech, Blacksburg, VA, USA in 2009, Dr. Lallart has been hired as an Associate Professor in the Laboratoire de Génie Electrique et Ferroélectricité. Since 2018, Dr. Lallart also holds an invited research fellowship position in NorthWestern Polytechnical University (NPU), Xi'An, China. His current field of interest focuses on electroactive conversion and its application to vibration damping and energy harvesting, as well as autonomous, self-powered wireless systems. Since 2006, Dr. Lallart published 80 papers in international SCI journals and 60 conference papers including 8 personally invited talks and 3 plenary talks. He edited 6 books and participated to 9 book chapters and reviewed more than 200 manuscripts for various journals. Dr. Lallart was also recipient as PI or key partner of national and international academic projects funded by ANR or European Union for instance, and participated to several industrial collaborations as well.

Abstract of the course:
This lecture aims at exposing key points in energy harvesting systems and devices with a particular focus on the design of a global electrical interface for energy harvesting. After a general overview of typical energy sources and associated conversion effects, along with good practices about their use, the specific case of proper electrical interface design will be devised. This will include the energy extraction enhancement through nonlinear process, load adaptation and voltage regulation. Specifies of several typical conversion effect (for instance piezoelectric or electromagnetic for vibrational systems and thermoelectric or pyroelectric for thermal devices) will also be pointed out and included in the proposed circuits. All along the lecture, participants will be proposed to implement themselves the proposed architectures in a simulation software.