UNIVERSITÀ DI PISA

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

Dottorato di Ricerca in Ingegneria dell'Informazione

Doctoral Course

"Thermoelectric nanodevices for microscavenging and macroharvesting"

Prof. Giovanni Pennelli

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Short Abstract:

ABSTRACT:

This course deals with the electrical and thermal transport at the nanoscale. The principles of nanofabrication and of the main nanotechnological processes are also covered by this course[1,2]. Techniques for the characterization of the transport at the nanoscale level, both electrical and thermal, will be illustrated and discussed.
The potentialities for nanodevices for thermoelectric conversion will be enlightened.
Finally, the main applications in the fields of energy scavengin and green energy harvesting of thermoelectric generators, based on nanostructured silicon, will be illustrated. Particular focusing will be given to the powering of sensor nodes for IoT and for Industy 4.0 applications.

Course Contents in brief:

- Nanotechnology and Nanofabrication
- Electrical and thermal transport: theory
- Thermoelectric characterization
- nanostructured thermoelectric generators for energy scavenging/energy harvesting.

Total # of hours of lecture: 16

References:

[1] E. Dimaggio, G.Pennelli Reliable Fabrication of Metal Contacts on Silicon Nanowire Forests, Nano Letters 16, 4348 (2016).

[2] G.Pennelli, Review of nanostructured devices for

thermoelectric applications, Beilstein Journal of Nanotechnology, 1268 (2014)

CV of the Teacher

Giovanni Pennelli is Associated Professor in the University of Pisa, Department of Information Engineering, where he teaches Physics of Electronic Devices in the Course for the graduation in Electronic Engineering. He is in charge of the research activities of the Nanotechnology and Nanofabrication Laboratory of the Department. He deals with high resolution electron beam lithography and other processes for the fabrication of silicon nanodevices. His research interests involve in particular the investigation of the electrical and thermal transport properties at the nanoscale.

Recently, he is investigating the applications of nanostructured devices for energy recovery and green energy harvesting.

He is author, or co-author, of more than 75 paper on international, high impact factor, reviews.

Room and Schedule

Room: *From remote by using Microsoft Teams. The link will be sent in due time to all students who registered to the seminar.*

Schedule:

Day1 – 9:00 - 13:00. Electrical and thermal transport in nanodevices: principles of thermoelectric conversion.

Day2 – 9:00 - 13:00. Main techniques for the fabrication of nanodevices based on silicon nanowires and nanostructures. Techniques for the thermal and electrical characterization at the nanoscale.

Day3 – 9:00 - 13:00. Energy scavenging and gree energy harvesting applications of nanostructured thermoelectric generator, with emphasis to the powering of Iot and of systems for Industry 4.0.

Day4 – 9:00 - 13:00. Energy scavenging and gree energy harvesting applications of nanostructured thermoelectric generator, with emphasis to the powering of Iot and of systems for Industry 4.0.