



UNIVERSITÀ DI PISA  
DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE  
Dottorato di Ricerca in Ingegneria dell'Informazione

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Doctoral Course

**Atomic Layer Deposition: Technology and Applications**

Dr. Lionel SANTINACCI

Research Scientist at CNRS  
Center for Interdisciplinary Nanoscience of Marseille, France

**Short Abstract:** After a general introduction on nanosciences and nanotechnologies, the principles and new developments of atomic layer deposition (ALD) will be described. The fundamental aspects as well as practical information will be presented in order to provide the basics to initiate an ALD process in the laboratory. A special attention will be drawn on the in situ and ex situ metrologies that are critical to develop well defined ALD processes. Applications of ALD to different fields will be also discussed, with special emphasis to the energy field. The use of ALD in the energy field will clearly highlight the interest of this tool to improve nanoscale devices.

**Course Contents in brief:**

- Introduction to nanoscience and nanotechnologies
- Atomic Layer Deposition – ALD - context, principle, metrology
- New developments of ALD
- ALD and energy applications
- ALD for solar fuel generation

**Total # of hours:** 15 (4 CFU)

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**CV of the Teacher**

Lionel Santinacci received a Ph.D. from the Swiss Federal Institute of Technology of Lausanne (EPFL) in 2002. His thesis has been carried out successively at EPFL (1998-2000) and Friedrich-Alexander-Universität-Erlangen-Nürnberg (2000-2002) under the supervision of Prof. Patrik Schmuki. His work involved the AFM-scratching induced surface electrochemical nanostructuring. During this time, he also performed surface modifications of III-V semiconductors by anodic processes (oxide and porous layers) in collaboration

with the National Research Council of Canada. He performed post-doctoral studies on Li-polymer batteries by electrochemical impedance spectroscopy at Aix-Marseille University (2002-2003). In 2003, he joined the Ecole Nationale Supérieure de Chimie de Paris (ENSCP) as non-tenured assistant professor to investigate the localized corrosion of Cu single crystal by in situ AFM (2003-2004). In 2004, he got a CNRS researcher position at the Lavoisier's Institute of the University of Versailles to continue the work on the anodic surface structuring of III-V materials such as InP in both aqueous and non-aqueous electrolyte. The porous layers exhibiting modified physical properties have been grown and characterized by electrochemical and optical methods. In 2009, he moved to the Center for Interdisciplinary Nanoscience of Marseille (CINaM).

He works on electrochemically grown one-dimensional nanostructures such as nanopores, nanotubes and nanowires that are functionalized by Atomic Layer Deposition for energy production and storage. The accurate tuning of the geometry as well as the control of the material combination lead to a better understanding of the charge transfer and/or photon interaction with the different interfaces. This approach has been illustrated by recent works in which the group has reported highly efficient systems for electrocatalysis or long stable electrodes for water photooxidation.

### **Room and Schedule**

Room: *Aula Riunioni del Dipartimento di Ingegneria dell'Informazione, Via G. Caruso 16, Pisa – Ground Floor*

Schedule: 15.04.2019 through 19.04.2019

**Monday 15.4.2019** – 9:30-12:30

**Tuesday 16.4.2019** – 9:30-12:30

**Wednesday 17.4.2019** – 9:30-12:30

**Thursday 18.4.2019** – 9:30-12:30

**Friday 19.4.2019** – 9:30-12:30