UNIVERSITÀ DI PISA

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

Dottorato di Ricerca in Ingegneria dell'Informazione

Doctoral Course

"Nanoscale Biohybrid Engineering"

Prof. Gianluca Ciardelli
Politecnico di Torino - Italy

Short Abstract: Advanced therapies [1] are innovative approaches to tackle unmet needs in medicine using new products based on a combination of biological entities and intelligent materials, the so-called "bio-hybrids". Engineers can significantly contribute to the design and implementation of these strategies by using their knowledge of multifunctional design and nanotechnology but are in need of additional understanding on how these enabling technologies interact with the living environment [2].

In this context, the course will inform engineers on the mechanisms that regulate the interaction of cells with the extracellular matrix, with special focus on molecular interactions developing at the nanoscale, and use these principles to illustrate how advanced, Nature inspired medical products can be designed and engineered. Selected, successful case studies will be illustrated as well.

Course Contents in brief:

- The biosynthetic interface: mechanisms and models (2 hrs)
- Design of Biomimetic Materials and Surfaces through Nanotechnology (4 hrs)
- Theranostic Nanoparticles (6 hrs)
- A Nanotechnology Case Study: the use of engineering design rules and modeling for generating biohybrid constructs (6 hrs)
- Nanotechnology and gene delivery (2 hrs)

Total # of hours: 20

References:

[1] Regulation on advanced therapies (Regulation (EC) 1394/2007)

[2] J.D. Kingsley et al. J. Pharm. Res. 2013, 7 (2), 200-204

CV of the Teacher

Gianluca Ciardelli (Ph.D) has a **Master Degree in Chemistry** summa cum laude, from the **University of Pisa** (1994). In 1997 he received the **PhD in Natural Sciences from** the Swiss

Federal Institute of Technology **(ETH) of Zurich** on synthetic degradable polyurethanes for biomedical applications.

He moved in 1997 back to Italy, where he started its activities at Tecnotessile in Prato, a private company for applied research, until June 2002. From 2002 and 2004 he was **assistant professor at the University of Pisa** at the Department of Chemical Engineering, Industrial Chemistry, Materials Science. In December 2004 he joined the Department of Mechanics at the **Politecnico di Torino** as **associated professor**. He became **Full Professor in 2011**. He has been scientific coordinator of a 4FP EU project, scientific unit coordinator of 2 Eu Streps Projects (5-6 FP) and 2 national Projects (PRIN). He is currently coordinator of a national project (PRIN) on relevant organ Models for the INvestigation of age related Diseases (MIND), involving research units in 11 Italian universities/research centers (Total Budget 2 M€). He is also managing or has recently managed 4 ERA-Net projects funded by the European Commission, 5 regional Projects, 1 Vigoni Project. Most of these projects have strong intersectorial character with involvement of the biomedical industry. Gianluca Ciardelli is coordinating a group of 15 people on average (Graduate Students and Post-docs, with an interdisciplinary background ranging from chemical, biomedical engineering and chemistry) carrying out research in the development of biomedical polymers and realisation of scaffolds for tissue engineering, drug delivery in nanomedicine, molecular recognition. He is currently teaching at bachelor (Chemical Bioengineering), Master (Bionanotechnology, Engineering in Regenerative Medicine, Biomimetic Systems), and Ph.D Level (Biomimetic and Bioinspired Systems: Applications in Biomedical Engineering) at Politecnico di Torino and in the course of Micro and Nanosystems at the University of Pisa. He has been organizers of one national and one international conference.

He is the author of over **110 peer reviewed international papers**, 9 book chapters and of 12 patents (of which 4 international), **the h-index is 25**.

Room and Schedule

Room: *Aula Riunioni del Dipartimento di Ingegneria dell'Informazione, Largo Lucio Lazzarino 1, Pisa – Aula Riunioni Piano 6*

Schedule:

Day1 – 28 November 2016, from 8.30-12.30

Day2 – 2 December 2016, from 9.00-13.00

Day3 – 5 December 2016, from 9.00-13.00

Day4 - 16 December 2016, from 9.00-13.00

Day5 - 19 December 2016, from 9.00-13.00

Day6 - 9 January 2017, from 9.00-13.00