



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

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Doctoral Course

**“Rapid prototyping for engineers”**

Dr. Carmelo De Maria  
University of Pisa- Research Center E. Piaggio

**Short Abstract:** Rapid prototyping is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data. Construction of the part or assembly is usually done using 3D printing or "additive layer manufacturing" technology. The process starts from a 3D model of a solid object obtained from CAD or from tomographic data such as CT scan. The thus digitized model is processed till ready for layer-by-layer reconstruction using 3D printing. Rapid prototyping is becoming an essential tool for all engineers, enabling rapid materialization of ideas. This course will give students a practical glimpse into the emerging field of digital printing.

**Course contents:** Starting from the physical principles underlying the fabrication procedures, the course will introduce the additive manufacturing technologies available for making functional prototypes for applications in various engineering fields. A lab session, with practical example, from design to manufacturing will close the course.

**Schedule:**

Lesson 1 – Type: frontal lesson; Duration: 3h

Topics:

- Introduction to additive manufacturing: classification, features, limitations, perspective
- CAD/CAM approach: software for additive manufacturing

Lesson 2 – Type: frontal lesson; Duration: 3h

Topics:

- Technologies for additive manufacturing: physical principles and working parameters of Stereolithography, Laser Sintering, Fused Deposition Modelling, Inkjet Based Technologies.

Lesson 3 – Type: Lab session; Duration: 4h

Topics:

- Step-by-step design and fabrication of a functional prototype

**Total # of hours: 10**

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## **CV of the Teacher**

Carmelo De Maria is a post-doctoral researcher at the Research Center E. Piaggio. He is an expert on rapid prototyping, and his research is focused on the fusion of different additive manufacturing technologies, such as hydrogel plotting, inkjet printing and electrospinning. Other research interests are in computational fluid dynamics and mechanical finite element modelling. The quality of the research is confirmed by papers on peer-reviewed journals and proceedings in international conferences. In particular he was an invited keynote speaker at the International Conference on Tissue Engineering (ICTE) 2013, 6-8 June Leiria (Portugal), with a presentation on "Inkjet printing for Tissue Engineering and Regenerative Medicine: applications and future perspectives". He is also a member of the COST Action BM1302 "Joining Forces in Corneal Regeneration Research" and workpackage leader in the H2020 project UBORA (Euro-African Open Biomedical Engineering e-Platform for Innovation through Education). De Maria is president of FabLab Pisa and advocates the Open Source approach in the design of biomedical devices. Deeply involved in open education and development, he is a visiting Professor at Addis Ababa University and co-organizer and lecturer of the Innovators' Summer School, under the sponsorship of the United Nation Economic Commission for Africa.

## **Room and Schedule**

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

Schedule:

Day 1 – 6/02/2017, from 9.30-12.30

Day 2 – 13/02/2017 from 9.30-12.30

Day 3 – 20/02/2017, from 9.30-13.30