UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

DOTTORATO DI RICERCA / PHD PROGRAM IN
INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING

Course announcement

Title: Nanotechnology for Materials and Devices in Microelectronics and Photonics

Lecturer: Teresa Crisci, Ph.D.

University Università degli Studi di Napoli Federico II
Email: teresa.crisci2@unina.it teresa.crisci@na.isasi.cnr.it

Short bio notes

Teresa Crisci is a physicist specializing in optoelectronics and photonics. She earned her PhD in *Mathematics, Physics, and Engineering Applications* in March 2023 from the University of Campania "Luigi Vanvitelli" and is currently an Assistant Professor (RTDa) at the University of Naples Federico II. Her research focuses on devices based on graphene and other advanced materials, spanning CMOS-compatible silicon photonics, plasmonic devices, and biosensors. She has extensive experience in the design, fabrication, and experimental characterization of micro- and nano-scale devices using standard microelectronics processes and advanced measurement techniques. Her work addresses challenges in integrating two-dimensional and novel materials into optoelectronic architectures, developing solutions for a wide range of applications, including telecommunications, biosensing, energy, and aerospace. She has participated in several national and European research projects and has published research papers in the areas of silicon photonics, integrated photonics, and optoelectronic devices.

Credits: 3

Overview

Nanotechnologies play a central role in a wide range of contemporary research and technological developments, from integrated electronic and photonic devices to biosensors and emerging quantum technologies. This course provides an introduction to the fundamental fabrication processes that enable these advances, focusing on how micro- and nano-devices are realized in controlled manufacturing environments such as cleanrooms.

The course introduces the main nanofabrication techniques, including thin-film deposition, lithography, etching, doping, and advanced material characterization, highlighting the combination of these processes to create functional structures. Emphasis is placed on the common technological foundations shared across different research fields, providing a unifying perspective on modern nanofabrication platforms. The course concludes with the study and analysis of advanced devices, examining how the learned techniques and materials are applied to design and realize innovative functional systems. A final assessment focuses on an advanced device, guiding students through the complete fabrication and characterization process, from initial design to functional testing.

Schedule

Lecture	Date	Time	Topics
1	24/06/2026 10.00-13.00	3h	Introduction and cleanroom environment, crystal growth and synthesis approaches, thin film deposition
2	26/06/2026 10.00-13.00	3h	Lithographic techniques, etching processes, material and devices characterization techniques
3	01/07/20216 10.00-13.00	3h	Graphene, nanostructures, innovative materials
4	3/07/2026 10.00-13.00	3h	Applications in advanced devices
			Assessment test

Content details

Lesson 1 – Basics of Nanofabrication Techniques

Lesson 1 introduces the main concepts of nanofabrication and controlled cleanroom environments. It covers safety and basic vacuum techniques, and begins exploring foundational fabrication methods, including top-down and bottom-up approaches, crystal growth, and thin-film deposition.

Lesson 2 – Lithography, Etching, and Material Characterization

Lesson 2 covers different lithography techniques for pattern transfer, etching processes, and main material characterization methods, including morphology analysis, microscopy, and electrical and optical measurements.

Lesson 3 – Innovative Materials and Nanostructures

Lesson 3 covers the synthesis and integration of graphene and other 2D materials, nanostructures, focusing on their use in electronics, biosensing, and photonics.

Lesson 4 – Advanced Devices Study

Lesson 4 focuses on the study and analysis of advanced devices, examining how fabrication techniques and innovative materials are applied to realize functional systems in integrated circuits, biosensors, and flexible or printed devices.

Participants are requested to send an e-mail to teresa.crisci2@unina.it, with the following information:

Student name and surname, name of the PhD course, PhD cycle.

For information: Prof. Teresa Crisci (DIETI, UniNA) – teresa.crisci2@unina.it *(organizer)*