P6: Biotechnology

- Laboratories of atomistic and micro-nano-fluidics simulations (UDI)
- Biophotonics laboratory
- Macromolecular structures
- Principles of biochemical engineering
- Electromagnetic fields and nanosystems for biomedical applications
- Synthesis and characterisation of bio-nano-materials (UDI)
- Advanced chemistry for nanotechnology

Requirements

Admission is subject to possession of:

1. A three-year university degree or diploma, or equivalent qualification obtained abroad.
2. a minimum of 85 CFU divided into the following subject areas:
   - at least 27 CFU in basic training (SSD: CHIM/03; FIS/01; FIS/03; MAT/02; MAT/03; MAT/05; MAT/06; MAT/07).
   - at least 58 CFU in the disciplines of industrial engineering (SSD: ING-IND/) and/or in specific areas of information engineering, mathematical and computer sciences, chemical and physical sciences (SSD: CHIM/02; CHIM/07; FIS/07; INF/01; ICAR/08; ING-INF/01; ING- INF/02; ING-INF/03; ING-INF/04; ING-INF/06; ING-INF/07; MAT/08; MAT/09).

   For students without the requirement, who hold a three-year degree obtained in Italy in a class other than engineering, enrolment is subject to verification by the Area Council (CAD). Verification is based on the student's CV, course programmes, and an interview designed to ascertain possession of the necessary knowledge. Even after the check, it is necessary to acquire, in addition to the requirements of the mandatory course offerings, a minimum of 12 CFUs in one or more of the following SDDs: ING-IND/31, ING-IND/13, ICAR/08, ING-IND/06, ING-INF/04, ING-IND/25.
3. an average mark achieved in the examinations of the degree course of origin of not less than 23/30. Otherwise, the student must take a written and/or oral admission test on subjects characterising the basic aspects of engineering. The programmes, procedures and timetable for the admission tests can be found on the CAD website. The admission test may ascertain sufficient or insufficient preparation. In the latter case, enrolment is not permitted.
4. A good fluency in English, corresponding to level B2 of the CEF (Common European Framework), for which appropriate certification must be produced.

Further details and information can be found on the pages:

corsidilaurea.uniroma1.it
web.uniroma1.it/nano

you can also contact:

Chair of the Master's Degree Course

prof. Alessio TAMBURRANO (alessio.tamburrano@uniroma1.it)

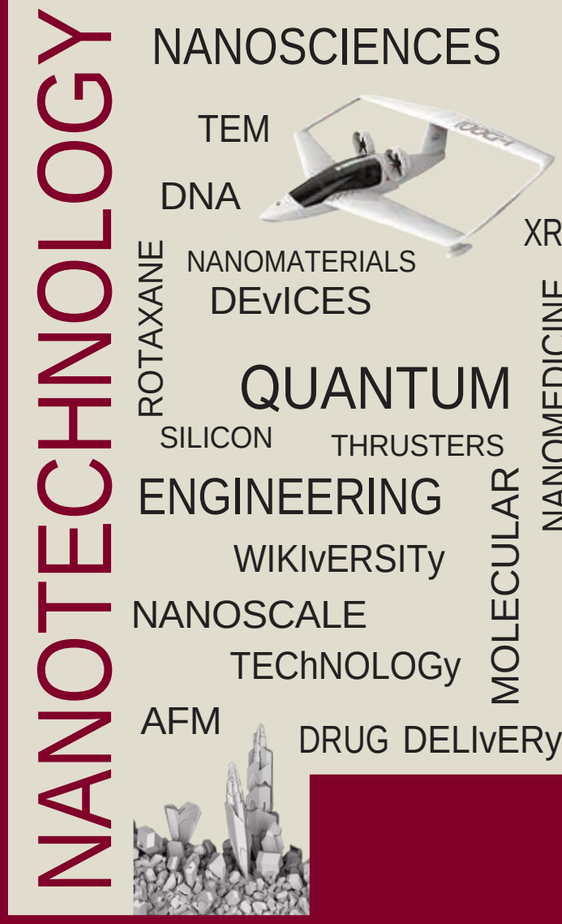
Council:

Prof. Antonio D'ALESSANDRO (antonio.dalessandro@uniroma1.it)

Prof. Marco ROSSI (marco.rossi@uniroma1.it)

Prof. Francesco MARRA (francesco.marra@uniroma1.it)

Prof. Walter LACARBONARA (walter.lacarbonara@uniroma1.it)



SAPIENZA
UNIVERSITÀ DI ROMA

Master's Degree Course in

Nanotechnology Engineering

*The **Master's Degree Course in Nanotechnology Engineering** offers advanced scientific-professional training with specific skills to deal with analysis, development, simulation and optimisation of nanotechnology-based devices, materials and processes.*

Goals:

The main goal of the course is the achievement of skills in: management and use of micro- and nanotechnologies for materials, biotechnologies and manufacturing processes of micro- and nano-devices; design with atomistic simulation methods of micro- and nano-devices for functional and multifunctional applications; design and management of complex micro- and nano-systems; risk and safety management in the use of nanotechnologies. The pathway ensures that the nanotechnology engineer knows how to integrate specific technical-scientific skills with contextual knowledge while preserving multidisciplinary competences. The nanotechnology engineer will be able to design and use new micro- and nanostructured, multifunctional and intelligent materials and surfaces, for the realisation of mechanical, electrical, electronic, electromagnetic, photonic, or hybrid nano- and micro-devices, and for the development of flow microsystems and reagents for the transport, separation, purification and amplification of cellular and sub-cellular compounds, of microprobes, of biocompatible materials for the recovery and rehabilitation of tissues and organs. The master's degree course in nanotechnology engineering is characterised by a largely developed laboratory activity in order to train in the student a marked sensitivity to realisation and application problems and high operational skills.

Job opportunities:

The nanotechnology engineer finds employment in the high-tech manufacturing industry working in the various engineering sectors: mechanical engineering, aerospace, automotive, transport, advanced materials, electrical engineering, processing and production processes, electronics and biomedical engineering. The nanotechnology engineer is also employed as a researcher in advanced research centres. The nanotechnology engineer can enter the Register of Engineers for the industrial section.

Structure of the Master's Degree Course:

The Master's Degree in Nanotechnology Engineering offers two pathways that differ essentially in the language of teaching:

- ***pathway A:*** *with courses taught mainly in Italian*
- ***pathway B:*** *with all courses taught in English, dedicated to international students*

Training pathway A includes the following teaching:

- 6 mandatory subjects (57 CFU)
- 2 optional subjects (12 CFU) in a first optional group
- 1 related course of your choice (9 CFU) in a second optional group
- 2 choice related (12 CFU) in a completion/specialisation block

The course of a total of 120 CFU is thus completed by:

- Students' free-choice lectures (12 CFU)
- Final exam (17 CFU)
- Other activities useful for integration into the world of work (1 CFU)

Mandatory subjects

- Chemistry for nanotechnology
- Principles of quantum mechanics with elements of matter structure and atomistic simulations (UDI)
- Surface and thin-film engineering and nanostructured materials (UDI)
- Microscopy and nanocaracterisation techniques
- Micro-nanofluidics
- Micro-nano devices and materials for electrical and electromagnetic applications

First optional group

- Continuous mechanics
- Laser surface structuring and additive manufacturing
- Metallurgy of nanostructured materials
- Mixing and separation processes at the micro-nano scale

Second optional group

- Integrated Micro-Nano Electronic Components
- Fabrication and characterisation of nanostructures and low-dimensional systems
- Chemical techniques and industrial processes for the production of micro and nano materials

Complementary examinations

P1: Production and characterisation

- Production and characterisation of nanocomposite materials (UDI)
- Production technologies of micro/nano particles and characterisation of nanostructured materials (UDI)
- Synthesis and characterisation of bio-nano-materials (UDI)
- Sensors and electrical/electromagnetic characterisation laboratory
- Laboratory of electrorheology
- Technologies and processes for electronics
- Laboratory of microscopy, diffraction, spectroscopy and tomography techniques (UDI)
- Dynamic characterisation of micro/nano-structures (UDI)

P2: Modelling

- Laboratories of atomistic and micro-nano- fluidics simulations (UDI)
- Transport phenomena in microsystems and micro-nano reactive devices
- Dynamics of micromechatronic systems
- Artificial materials, metamaterials and plasmonics for electromagnetic applications
- Advanced chemistry for nanotechnology

P3: Design and testing di micro/nanodevices

- Sensors and electrical/electromagnetic characterization laboratory
- Laboratory of electrorheology
- Dynamics of micromechatronic systems
- Photonic microsystems
- Microelectromechanical systems
- Electromagnetic fields and nanosystems for biomedical applications

P4: Electronics

- Nanoelectronics laboratory (UDI)
- Innovative nanoelectronic sensing devices
- Optoelectronics
- Microelectromechanical systems
- Laboratory for microscopy, diffraction, spectroscopy and tomography techniques (UDI)

P5: Optics

- Biophotonics Laboratory
- Artificial materials, metamaterials and plasmonics for electromagnetic applications
- Optoelectronics
- Optics
- LASER fundamentals
- Photonic microsystems

* For more details on pathway B, please consult the Manifesto of the Master of Science in Nanotechnology Engineering at the following page: https://web.uniroma1.it/nano/didattica/manifesto