



# MASTER DEGREE IN NANOTECHNOLOGY ENGINEERING

## FOR EDUCATIONAL NEEDS IN A WORLD IN CONSTANT TECHNOLOGICAL CHANGE

Nanotechnology refers to a wide range of high technology activities including the design, characterisation, production and application of structures, devices and systems through shape control and measurement at the nanoscale. Nanotechnologies are one of the so-called Key Enabling Technologies (KETs) and by their intrinsic nature are multidisciplinary, involve technologies from different sectors and have a tendency to converge and integrate. Public and private research institutions in all major countries are currently engaged in advanced, expensive and complex research programmes that are promoting nanotechnology from basic to applied research, with a view to an increasingly extensive engineering of processes and products derived from nanotechnology. Today, the development of nanotechnologies represents the new frontier on which industries are facing on an increasingly globalized and competitive international level. Nanotechnologies require deep knowledge, high R&D intensity, substantial investment expenditure and ensures fast innovation cycles and highly skilled jobs. Nanotechnologies allow the evolution of many highly strategic and high-impact systems, in the fields of energy, information and data, food, mobility, innovative materials, cutting-edge pharmaceutical and medical applications, with increasing attention to the environment and recycling of waste.

**The challenge for technological innovation and industrial competitiveness requires a new professional figure in the field of Nanotechnologies, which combines a wide and solid basic engineering culture with knowledge in chemistry and physics, in order to understand and manage the new planning tools offered by nanotechnologies, for applications in different engineering sectors.**

### THE ANSWER OF SAPIENZA University of Rome

**With the introduction of the Master's Degree Course in Nanotechnology Engineering, Sapienza University of Rome has set itself at the forefront both nationally and internationally, being the first in Italy to offer a complete training course in the field of nanotechnology oriented to engineering applications.**

The Master's Degree in Nanotechnology Engineering offers advanced scientific-professional training with specific skills to deal with analysis, development, simulation and optimization of devices, materials and processes based on nanotechnology. Actually, the study plan also takes advantage of the skills of researchers at the Interdepartmental research center on nanotechnologies applied to engineering of Sapienza (CNIS). The Centre currently gathers the multidisciplinary skills of over 100 Professors and Researchers, belonging to different Departments of the Sapienza University of Rome and to different Faculties of Engineering, Science and Medicine.

On the basis of the experience gained in the first ten years, the study plan of the Master's Degree in Nanotechnology Engineering also for the a.y. 2020-21 offers two courses, of similar educational content, which are distinguished by the language of delivery:

- **strand A:** with courses taught in Italian
- **strand B:** which includes teaching in English, dedicated mainly (but not only) to international students

Both training courses provide an in-depth study of the basic knowledge of nanotechnology engineering, **allowing the student to choose the specialization they prefer, giving them the possibility to choose from a number of in-depth courses and educational workshops available, including topics such as characterization, production, modeling, design, electronics, optics and advanced biotechnology.** Furthermore, the techniques and methods of analysis and design of new materials and micro and nanostructured, multifunctional and intelligent materials and surfaces are studied, for the realization 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 subcellular compounds, of micro-probes, of biocompatible materials for the recovery and rehabilitation of tissues and organs. In order to complete and perfect the training, it will be essential to attend laboratories, where the aspiring engineer will be able to verify what he has studied in the field of modeling and scientific experimentation.

### THE JOB

The nanotechnology engineer will be able, depending on his specific preparation, to design and develop smart and multifunctional materials and devices, to be used in different fields of industrial engineering, sensor devices, with particular attention to the development of technologies and processes aimed at developing the functional properties of new materials through the control of the structure on atomic and molecular scale. Furthermore, he will be able to design and develop devices and materials for advanced biotechnology, such as microsystems at flow and reagents for the transport, separation, purification and amplification of cellular and subcellular compounds, microprobes or biocompatible materials for the recovery and rehabilitation of tissues and organs. The Course prepares, therefore, to the professions of engineer expert in micro- and nano-technologies, engineer expert in the development of products, devices and materials through the use of advanced technologies, engineer expert in the design and management of complex micro and nano systems. The nanotechnology engineer finds employment in the high-tech manufacturing industry operating in the various engineering sectors (mechanical engineering, aerospace, automotive, transport, advanced materials, electrical engineering, bioengineering, transformation and production processes, biomedical engineering) and in companies operating in the electronics sector.

### POST DEGREE

**The Master's Degree in Nanotechnology Engineering is highly appreciated, both in Italy and abroad, thanks to the multidisciplinary nature of the training path combined with the high specialized and innovative professional characteristics, as demonstrated not only by the direct experience of our former students who successfully completed this engineering school, but also by the most recent data released by AlmaLaurea (<http://www.almalaurea.it>) for graduates in 2012.**

#### EMPLOYMENT STATUS FIVE YEARS AFTER HAVING OBTAINED THE TITLE FOR GRADUATES IN 2012

Statistical data	MD Nanotechnology Sapienza	Medium Faculty Engineering Sapienza	National Engineering media
Work	85,7%	82,3%	78,6%
Work with a permanent contract	100,0%	62,7%	55,4%
Attended at least one training activity	85,7%	65,7%	65,3%
PhD (ongoing and/or completed)	42,9%	19,4%	10,3%
Average monthly salary (net)	1959 Euro	1713 Euro	1576 Euro

**More information are available here <https://web.uniroma1.it/nano/>**