

Chemistry for Nano-Engineering

Master Degree - (English-taught) - Department: Industrial Engineering

General Information

- Class: LM-71
- Course type: Master Degree
- Duration: 2 years
- Access type: Open with curriculum evaluation
- School: Engineering
- Department: Industrial Engineering
- Course code: T15

Description and Teaching Objectives

The International Joint Master Degree Chemistry for Nano-Engineering is a two-year program of 4 semesters (120 ECTS), developed by University of Rome Tor Vergata, Rome, Italy in cooperation with Aix Marseille University, Marseille, France and Wroclaw University of Science and Technology, Wroclaw, Poland. A Joint Master Degree Diploma fully recognised in the three universities will be delivered at the end of the Master.

Mobility Scheme. Year 1: Students will start the first semester in Marseille (30 ECTS) and will continue the second semester in Wroclaw (30 ECTS). Year 2: The third semester will be in Rome (30 ECTS) while the last semester is dedicated to the Master Thesis Project (30 ECTS). The students will have an opportunity to choose for their fourth semester a master thesis subject proposed by Partners and Associated Partners/Industry.

Structure of the program: the first semester (FR) provides the fundamentals of chemistry and modeling; the second semester (PL) specializes in nano-engineering; the third semester (IT) gives further elements for the application of complex nano-engineering systems.

The main objectives of the proposed master degree are the following:

- 1) Offering a widely cross-disciplinary training to students in the domain of nano-engineering with a profound understanding of nano-systems synthesis methods.
- 2) Training students in numerical modelling to predict physico-chemical properties of nano-systems.
- 3) Preparing students for a career in nanotechnology by providing a solid background in multidisciplinary areas of nanoscale science and engineering.
- 4) Giving the students a double competence required in the modern nano-science applications: experimental analysis supported by numerical modelling

Career Opportunities

This Master course defines new professional requirements taking advantage of the synergistic skills of a strong chemical knowledge combined with a strong engineering and application preparation.

The Master course aims to put on the employment market highly skilled people with a broad culture in chemistry, nano-science and engineering, with a real capacity to adapt themselves to the quick and numerous technological evolutions of the domain. Having acquired a wide spectrum of knowledge in the field, these persons will be able to propose original approaches integrating the various aspects of problems to be addressed in future nano-engineering challenges. The target is educating a new generation of students who can participate in the development of new high-technology companies. The Master enables students to develop a variety of professional, scientific and computational skills that will enhance employment opportunities in a wide range of industrial and academic institutions.

Web references and Contacts

Coordinator Roma Tor Vergata University: Professor Maria Luisa Di Vona

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Coordinator Aix-Marseille University: Professor Bogdan Kuchta

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Coordinator Wroclaw University of Science and Technology: Professor Szczepan Roszak

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Training program (main modules)

ECTS

	Lecture Modules	S1	S2	S3	S4	Total
1	Foundations in Chemistry and in Nano-science	13	03	08	00	24
2	Chemical and Materials Engineering	00	06	10	00	16
3	Applications of Nano-engineering	00	08	08	00	16
4	Thermodynamics and Modeling of Nano-materials	13	06	00	00	19
5	Nano-engineering Seminar + Project	02	02	02	00	06
6	Language (English)	02	02	02	00	06
7	Economics	00	03	00	00	03
8	Master Thesis Research Project	00	00	00	30	30

Total 120

Teaching program for CHEM NANO ENG

	Marseille Sem.1	Wroclaw Sem.2	Rome Sem.3	Sem.4
Lecture modules	(Nano-Chemistry)	(Nano-Engineering)	(Nano-Applications)	
1	Nano-Electrochemistry (3 ECTS)			Master Thesis
	Solid State Chemistry and Nano-materials (7 ECTS)	Structure and Crystallography of Solids (3 ECTS)	Characterization of Nano-Engineering Systems (6 ECTS)	
	Organic Chemistry of Nano-materials (3 ECTS)		NMR of Nanosystems (2 ECTS) (Option A: Chemistry)	
		Synthesis and Fabrication of Nano-engineering Systems (3 ECTS)	Nanoscale Synthesis Methods (5 ECTS)	
2		Fabrication of Smart Polymers (3 ECTS)	Macromolecular and Supramolecular Chemistry/ (5 ECTS)	
3		Engineering of Nano-machines (3 ECTS)	Structural and Functional Properties of Biopolymers (3 ECTS) (option A: Chemistry)	
		Bio-photonics (2 ECTS) Biomaterials-Biomedical Devices (3 ECTS)	Nanoscale Energy Technology, Nano-sensors and Micro-fluidics (5 ECTS)	
	Basic Quantum Chemistry Modeling (3 ECTS)		Nanoscale Structural transformations and Kinetics (2 ECTS) (option B: Modeling)	
4	Computational Modeling of Nano-Systems (7 ECTS)	Nanostructures in Industrial and Numerical Applications (6 ECTS)	Probability and Statistical Methods for Modelling Engineers (3 ECTS) (Option B: Modeling)	
	Thermodynamics of Materials-Interactions and Surface Forces (3 ECTS)			
5	Nano-engineering Seminar + Project (2 ECTS)	Nano-engineering Seminar + Project (2 ECTS)	Nano-engineering Seminar + Project (2 ECTS)	
6	Language (2 ECTS)	Language (2 ECTS)	Language (2 ECTS)	
7		Economics and Management (3 ECTS)		

