

General Information	MASTER DEGREE IN BIOTECHNOLOGIES
Title of the subject	NANOBIOTECHNOLOGIES AND BIOSENSORS
Degree Course (class)	Industrial and Environmental Biotechnology (LM-8)
ECTS credits	6
Compulsory attendance	Yes
Language	ITALIAN (ENGLISH ON REQUEST)
Academic year	2020-2021

Subject Teacher		
Name and Surname	GIUSEPPE MARUCCIO	
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Place and time of reception	ON-LINE UPON REQUEST	
ECTS credits details	Discipline sector (SSD)	Area
	FIS/01	---

Study plan schedule	Year of study plan		Semester	
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Time management	Lessons	Laboratory	Exercises	Total
CFU	5	1		6
Total hours	125	25		150
In-class study hours	40	12		52
Out-of-class study hours	85	13		98

Syllabus	
Prerequisites / Requirements	
Basic knowledge of mathematics and applied physics	
Expected learning outcomes (according to Dublin descriptors)	
Knowledge and understanding	<ul style="list-style-type: none"> • <i>Understanding of the structure, principles of operation and transduction of various classes of biosensors (optical, electrochemical / electrical, mechanical, ...) and their figures of merit.</i> • <i>Learn the benefits of miniaturization, microfluidics and lab on chip.</i> • <i>Learning of modern micro- and nano-manufacturing techniques</i> • <i>Learning the basic concepts of scanning microscopy, nano (bio) mechanics and cytomechanics, mechanical characterization at the nanoscale.</i> • <i>Knowledge of nano-materials of interest for applications in the industrial, environmental, bio-medical and nanomedicine sectors. Learning the benefits they present and training in their use.</i>
Applying knowledge	Learning of the fabrication and operation of biosensors and lab on chips through direct experience in the laboratory. Understanding of

	practical applications and recent developments of relevance to the industrial, environmental, biomedical and agri-food sectors.
Making informed judgments and choices	Acquiring the ability to distinguish the validity of bibliographic sources with a critical spirit.
Communicating knowledge	Acquisition of the ability to present in seminar form a research and / or a project proposal relating to the nanobiotechnology sector.
Capacities to continue learning	Acquisition of the ability to carry out a bibliographic search and independently learn aspects relevant to the research carried out and the latest progress achieved in the nanobiotechnology sector.
Study Program	
Content	<ul style="list-style-type: none"> • Part I Biosensors. The concept of biosensor. Advancements and classification of biosensors. Main figures of merit. Elements of (bio) recognition. Physical Measurements and Transduction Modes. Neuroelectronics. • Part II Microfluidics and Lab on chip. Microfluidics: introduction, theoretical hints and flow regimes, microfluidic components, Lab - On - a Chip. Some practical applications and recent developments of relevance for the industrial, environmental, biomedical and agri-food sectors. • Part III Micro and nano-fabrication. Miniaturization, lithographic techniques, hard and soft lithographies. • Part IV SPM and Nano (bio) mechanics. Atomic Force Microscopes. Interactions and mechanical properties at the nanoscale. Cytomechanics. Molecular motors. • Part V Nano biomaterials and their applications. Nanomaterials and their applications for imaging, diagnosis, therapy, bioremediation, drug delivery, intracellular sensors. Some recent applications.
Bibliography and textbooks	Slides and lecture notes
Notes to textbooks	-
Teaching methods	Multimedia power point presentations containing animations and images designed to illustrate the main topics of the course. Presentations are provided to students before class to allow them to take notes during the classroom explanation.
Assessment methods (oral, written, ongoing assessment)	The exam consists of an oral exam aimed at verifying the ability to clearly and rigorously present some course contents starting from a power point presentation on a topic chosen by the student and continuing with a question on topics related to other teaching units.
Evaluation criteria (describe criteria for each of the above expected outcomes)	The level achieved in terms of knowledge / autonomy / communication skills and ability to learn will be assessed on the basis of the aforementioned expected learning outcomes.
Further information	