Erasmus Mundus Joint Master GREENANO

SYLLABUS

Semester 2

COURSE NAME:	**New Perspective for Nanodevices by Carbon Allotropes**		
HOSTING UNIVERSITY:	Tor Vergata University of Rome		
SEMESTER:	**NUMBER OF ECTS:**	**PILLAR:**	
II	6	3	
DISTRIBUTION OF HOURS			
Lectures	*Seminars*	*Lab work*	*Individual student work*
40	6 (invited professor)	12	20
PROFESSOR:	Manuela Scarselli		
LEARNING AND TEACHING METHODS:	Theoretical lessons and laboratory activities.		
PREREQUISITES:	CLASSICAL MECHANICS (energy, mechanical properties, thermal properties) QUANTUM PHYSICS APPLLIED TO SOLID STATE MATTER (metals, semiconductor, energy bands and structure of solids, density of states, etc.) PHYSICS OF DEVICES (p-n junction, diode, transistors BJT, MOSFET) INTERACTION OF RADIATION WITH MATTER (photons and electrons)		
OBJECTIVES OF THE COURSE:	Give an overview of the elaboration and fabrication methods of synthesis of carbon allotropes Illustrate some basic characterization techniques to understand the morphological, electronic and chemical properties of carbon nanostructures applications as active layer for sensing, water purification, solar cells, photodetectors		
CONTENT OF THE COURSE:	structure, properties and symmetry of carbon new allotropes (e.g. graphene, fullerene, carbon nanotubes). Carbon allotrope fabrication (chemical vapor deposition, laser ablation, arc discharge) under different environments (air, controlled atmosphere, and liquid). Experimental techniques for the characterization of the electronic, optical, transport and elastic properties (Raman, SEM, TEM, I-V curves, mechanical tweezer, visible-UV absorption measurements, and other spectroscopies). Three-dimensional sponges by carbon nanotubes and applications (e.g. water purification, biomedical prosthesis, mechanical transducer). Applications of carbon allotropes as active components in nano-devices (e.g. solar cells, photodetectors, transistors). Laboratory activities: synthesis of carbon allotropes (e.g. chemical vapour deposition growth of carbon nanotubes and sponges), electrical measurements, solar cells fabrication and characterization.		
INTENDED LEARNING OUTCOMES:	At the end of the course each student must have acquired a basic knowledge of: * the structural and electronic properties of some carbon nanostructures; ** the most important experimental techniques to characterize them. In addition, the student will have to have acquired design skills for the development of potential devices based on them.		
FORM OF ASSESSMENT:	Colloquium and open discussion of a selected subject developed by the student		