UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2016/2017
MASTER'S DEGREE (MSC)	CHEMISTRY
SUBJECT	MATERIALS PREPARATION AND CHARACTERISATION
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20975-Attività formative affini o integrative
CODE	16494
SCIENTIFIC SECTOR(S)	CHIM/02
HEAD PROFESSOR(S)	SALADINO MARIA LUISA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	81
COURSE ACTIVITY (Hrs)	69
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**SALADINO MARIA LUISA** Monday 14:00 16:00 Dipartimento STEBICEF, Edificio 17, piano I Wednesday 14:00 16:00 Dipartimento STEBICEF, Edificio 17, piano I Thursday 14:00 16:00 Dipartimento STEBICEF, Edificio 17, piano I

DOCENTE: Prof.ssa MARIA LUISA SALADINO

PREREQUISITES	The student must have a good knowledge of the basic contents of the chemistry and the basic principles of physics, and in particular the process of interaction of radiation with matter.
LEARNING OUTCOMES	Students must acquire the tools for the design and application of synthetic methods and preparation of nanomaterials and nanostructured compounds. Furthermore, they must acquire and to understand the basic concepts for the application of morphological and structural characterization techniques of materials. At the end of the course students will be able to determine the chemical and physical properties of a material, and to have gained the ability to apply knowledge and skills related to the use of nanomaterials preparation methods and chemical-physical techniques to the characterization of nanomaterials, inserted in larger contexts and interdisciplinary. They will be able to explore topics through specific scientific articles and to follow seminars and insights in the field of environmental chemistry.
ASSESSMENT METHODS	The exam consists of the evaluation of the laboratory reports and of an interview to ascertain the possession of skills and subject knowledge provided by the course. The reports must clearly illustrate the method used, the experience results and conclusions. The candidate will have to answer at least two questions posed orally on all parts of the program. The reports are intended to verify the processing capacity: 1) by providing independent judgment with respect to the subject content used: by identifying the effect of the experimental preparation parameters on the properties of materials; by evaluating the difficulties and the advantages resulting from the use of analytical techniques chosen; 2) by illustrating the application of the subject content; 3) by demonstrating that they have the ability to integrate knowledge and handle complexity and formulate hypotheses also based on limited and incomplete information. Final assessment aims to evaluate whether the student has knowledge and understanding of the topics and has acquired interpretative competence and independence of judgment. The candidate must be able to explain the basic concepts related to material properties and physical principles underlying the analysis techniques and know how to communicate in a clear and unambiguous manner, even to non-expert stakeholders, the knowledge gained. The assessment is expressed in thirtieths. The pass mark will be reached when the student shows knowledge and understanding of the issues at least in broad outline, and proves to be able to transpose the content in solving a real problem. the student must also have presentation and argumentative skills as to allow the transmission of his knowledge to the examiner.
EDUCATIONAL OBJECTIVES	The course aims to deepen some topics related to nanostructured systems. In particular, the teacher will deepen some of the main methods of synthesis and preparation of nanomaterials and nanostructured composites and the chemical-physical concepts related to structural and spectroscopic properties of these materials. In addition, the physical principles and the methods of application of some techniques of structural analysis will be expressed. Laboratory activities seek to address issues related to the experimental synthesis and preparation of nanoparticles and polymer composites and structural and spectroscopic characterization of the synthesized materials.
TEACHING METHODS	The course consists of lectures and laboratory exercises.
SUGGESTED BIBLIOGRAPHY	Peter William Atkins, Julio de Paula, Chimica fisica, V Ed Italiana Materiale fornito dal docente

SYLLABUS

Hrs	Frontal teaching
1	Purpose of the course. Procedures for the examination. Methods of writing of laboratory reports.
1	Nanomaterials. Nanoparticles.
1	Methods of synthesis and preparation of nanoparticles.
2	Synthesis of nanoparticles in confined environments
2	mesoporous materials. Synthesis of MCM 41 in an acidic and in a basic environment.
1	Nanostructured composites
2	Preparation of polymer nanocomposites
1	Main characterization methods of nanoparticles, mesoporous materials and nanocomposites
1	physical principles of the small angle scattering of X-rays and neutrons (SAXS SANS).
1	peculiarities of neutrons: contrast method.
3	Methods of analysis of small angle scattering data

SYLLABUS

Hrs	Frontal teaching
2	physical principles of Scanning and Transmission Electron Microscopy (SEM TEM)
1	Methods of preparation of samples for TEM
1	Infrared spectroscopy
1	physical principles of Nuclear Magnetic Resonance (NMR)
1	Solid State NMR
1	Cross polarization, magic angle spinning
1	NMR Spectroscopy: applications

Hrs	Workshops
3	Preparation of mesoporous silica MCM 41
2	Functionalization of MCM-41 silica by grafting
4	Preparation of Ce:YAG nanoparticles
3	Preparation of a Ce:YAG- polymer nanocomposite
3	preparation of a MCM$!-polymer nanocomposite
14	Characterization of obtained materials by using infrared spectroscopy, XRD, SAXS, TEM and solid-state NMR
3	SAXS characterization of a microemulsion
6	SAXS data elaboration (microemulsion)
7	Discussion of the results and preparation of laboratory reports.