UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2020/2021
MASTER'S DEGREE (MSC)	CHEMICAL ENGINEERING
SUBJECT	POLYMERIC AND COMPOSITE MATERIALS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50352-Ingegneria chimica
CODE	16406
SCIENTIFIC SECTOR(S)	ING-IND/22
HEAD PROFESSOR(S)	DINTCHEVA NADKA TZANKOVA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	108
COURSE ACTIVITY (Hrs)	42
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**DINTCHEVA NADKA TZANKOVA** Tuesday 14:00 16:00 DICAM - Ed. 6, terzo piano Thursday 14:00 16:00 DICAM - Ed. 6, terzo piano

DOCENTE: Prof.ssa NADKA TZANKOVA DINTCHEVA

PREREQUISITES	In order to understand the topics and to easily achieve the learning goals of the teaching course, the student must be confident with the following subjects: Chemistry, Applied Chemistry and Physics
LEARNING OUTCOMES	Knowledge and understanding ability The student, at the end of the teaching course, will know the main topics related to the structure and production of several classes of materials: polymers, ceramics and composites. Special attention will be paid to the properties and applications of aforementioned materials. Ability to apply knowledge and understanding The student will be able to learn and discuss about: • Matter state of aggregation and molecular structures in solids: amorphous and crystalline materials • Characterization of materials on the base of their physical properties: polymers, ceramics and composites. • Production and properties of polymers • Production and properties of ceramics • Mechanical characterisation of materials • Appropriate choose of materials based on requested application Judging autonomy The student will be able to determinate the main physical-chemical properties of different classes of materials. Furthermore, it will be able to identify the appropriate material for a specific application. The student will also be able to discriminate the materials and their main properties and to identify the main methodologies for production and processing. Communication ability The student will acquire the capability to communicate and express problems inherent the course topics. The student will be able to highlight questions related to the preparation and processing of different materials, exposing the information in an adequate technical language. Learning ability At the end of the course, the student will have learnt how to choose the appropriate material, to characterize it, and to optimize the production conditions.
ASSESSMENT METHODS	The evaluation will be based on two tasks: a written test and interview. The final assessment is on a 30 basis according to the criteria reported below: 30-30+: excellent knowledge of the topics, excellent language and vocabulary, good analytical capability, the student is able to apply knowledge to solve the proposed problems 26-29: Good management of the topics, nice language and vocabulary, the student is able to apply knowledge to solve the proposed problems 24-25: basic knowledge of the topics, fair language and vocabulary, limited capability to apply autonomously knowledge to solve the proposed problems 21-23: the student does not show full management of the main topics while possessing the knowledge, satisfactorily language and vocabulary, poor capability to apply autonomously the acquired knowledge 18-20: minimal basic knowledge of the main topics and of the technical language and vocabulary, poor or no capability to apply autonomously the acquired knowledge. The exam will be not passed if the student will show a not acceptable knowledge of the topics. The written test aims to ascertain the possession of the envisaged skills and competences. It includes three questions related to the main topics of the course program, related to (i) methods of formulation and structural characterization of polymeric materials; (ii) processing methods and characterization of polymeric materials through different experimental techniques; (iii) manufacturing and characterization methods for polymer-based composite materials. The oral exam has the objective to test the basic competences and expositive skills of the examiner. The questions will cover all the topics of the program reported in this sheet and will tend to verify the acquired knowledge, the processing abilities, the possession of skills and the ability to understand the applications related to the areas of the discipline.
EDUCATIONAL OBJECTIVES	The course aims to study the industrial production and the physical-chemical properties of materials, including the main structure – properties – processing relationships. The final part of course will be devoted to the study of the formulation and production of composites materials.
TEACHING METHODS	Lectures, Exercises
SUGGESTED BIBLIOGRAPHY	• W.F. Smith, “Scienza e Tecnologia dei Materiali”, Mc Graw Hill 3° ed 2008 • S. Bruckner, G. Allegra, M. Pegoraro, F.P. La Mantia, “Scienza e tecnologia dei materiali polimerici” EdiSES, 2007 • Dispense distribuite dal docente

SYLLABUS

Hrs	Frontal teaching
2	Introduction on the industrial production of materials and their properties
13	Polymers: - Macromolecules: structure and classification; - Reactions of polymerization and their industrial applications; - linear and non-linear viscoelasticity and rheometry; - Properties of polymers in the solid state: optical, mechanical, thermo-mechanical, thermal and morphological properties.
10	Ceramics. - Crystalline structures of ceramics and silicates; - Production and transformation of ceramics; - Electrical, mechanical and thermal properties of ceramics; - Glasses and refractories.
10	Composites: - Classical fibers and particles based composites; - Isotropic and anisotropic properties: micro-mechanics in iso-strain and iso-stress conditions; - Specific examples of composite materials: Portland cement and asphalt; - Micro- and nano-composites: production and applications.

Hrs	Practice
3	Static tensile test: measurement of elastic modulus, tensile strength and elongational at break. Measurement of impact strength for different materials
2	Measurement of viscosity and moduli in the molten state
2	Composite materials: calculation of mechanical properties in iso-stress and iso-strain conditions