UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2019/2020
BACHELOR'S DEGREE (BSC)	BIOMEDICAL ENGINEERING
SUBJECT	SCIENCE AND TECHNOLOGY OF MATERIALS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50301-Ingegneria dei materiali
CODE	06328
SCIENTIFIC SECTOR(S)	ING-IND/22
HEAD PROFESSOR(S)	BOTTA LUIGI Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	144
COURSE ACTIVITY (Hrs)	81
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**BOTTA LUIGI** Monday 15:00 17:00 Ufficio (Ed. 6, terzo piano) Thursday 15:00 17:00 Ufficio (Ed. 6, terzo piano)

DOCENTE: Prof. LUIGI BOTTA

PREREQUISITES	Knowing the atomic structure, chemical bonds Understanding the chemical balance and its rules Know how to resolve the acid-base and redox equations
LEARNING OUTCOMES	Knowledge and understanding Knowledge regarding: - new types of materials with particular reference materials for bioengineering - the correlation between the properties and the various types of materials - the life cycle assessment of materials The understanding regarding: - the interpretation of the properties of materials - the choice of the most suitable methods to choose the materials - identification and methods of materials characterization - the understanding of the most significant characteristics of the materials Applying knowledge and understanding The skills transferred to the student are: - the interpretation of the experimental tests - modeling of the behavior of a composite material under particular stress states Making judgements - The student will have acquired the ability to communicate and express issues involved with innovative materials to be applied in biomedical engineering. - the student will be able to make the choice of the most suitable technology for the realization of the functional artifact to the project, individually evaluating the effectiveness of the different solutions. Communication - The student will have acquired the ability to communicate and express issues involved with innovative materials for application in the construction industry. - The student will be able to hold conversations on topics related to the choice of the most suitable materials to the project and with less environmental impact, of exploring ideas and offer solutions to specialists and non-specialists. Learning skills - Based on the information obtained, the student will be able to learn from sources from the scientific literature and keep abreast of new techniques and new materials. - During the course, the student will be directed in order to gain awareness of the importance of a permanent update to the maintenance of a good level of knowledge and professionalism.
ASSESSMENT METHODS	The evaluation will be based on two tasks: a written test followed by an oral examination. The written examination consists in a test containing exercises and questions to be answered openly in a maximum time of 3 hours. The oral examination includes questions relating to the written test and at least a further question about different topics covered during the course. These examinations aim to evaluate some basic competences and problem solving capability of the student. Furthermore, the aim is to assess the competences and the knowledge learnt during the course. The stimuli, well defined, clear and univocally interpretable allow formulating the answer in full autonomy. Moreover, they are structured in order to allow the comparability. The questions will verify: acquired knowledge; elaboration capability; talking capability; ability to build autonomous connections not bound to the referring textbooks; capability to produce autonomous evaluations inherent the course topics; capability to understand the applications connected with the discipline areas; capability to connect the discipline topics with the referring professional and technological context. 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.
EDUCATIONAL OBJECTIVES	The course aims to provide knowledge about the structure, properties' and technological applications of the main types of materials used in biomedical engineering
TEACHING METHODS	Front lessons; exercises in class; visits to the Laboratory of Materials of DICAM.

SUGGESTED BIBLIOGRAPHY	Smith “Scienza e Tecnologia dei Materiali” McGraw-Hill Callister Jr., Rethwisch “Scienza ed Ingegneria dei Materiali” Edises

SYLLABUS

Hrs	Frontal teaching
2	Main types of materials: metals, ceramics and polymers.
4	Crystalline structure of metals: crystalline lattices and unit cells. real crystal structures: point defects, line and surface
8	Ferrous alloys: steels and cast irons. Production of crude steel and cast iron. State diagram Fe-C: Transformations peritettica eutectic and eutectoid. TTT diagrams
6	Plastics, thermosetting and thermoplastic polymers: structure, properties' and applications
8	Ceramic Materials: structure, properties 'and applications, Chemical and physical properties of clays. The manufacturing process: structure, properties' and applications
8	Composite Materials: Structure, properties' and applications
6	Hybrid materials. Foams and honeycomb structures
4	Rubber elasticity. Elastomeric materials
5	Durability of materials

Hrs	Practice
4	Determination of crystal lattices: Electron Microscopy and X-Ray Calculation of density
8	Calculation of the composition of the phases of a steel through the use of state diagram Fe-C
8	Mechanical characterization of materials: static tensile and compressive tests, hardness tests, impact tests, fatigue and creep. Determination of the elongation resistance and rigidity 'for various types of materials
4	Calculation of a glass softening temperature. Resilience measurement
4	Determination of loads in a structure in composite material
2	Application examples of the materials in the field of bioengineering