



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>SCHOOL</b>	POLYTECHNIC SCHOOL
<b>ACADEMIC YEAR</b>	2016/2017
<b>FIRST CYCLE COURSE</b>	BIOMEDICAL ENGINEERING
<b>SUBJECT</b>	SCIENCE AND TECHNOLOGY OF MATERIALS
<b>TYPE OF EDUCATIONAL ACTIVITY</b>	B
<b>AMBIT</b>	50296-Ingegneria biomedica
<b>CODE</b>	06328
<b>SCIENTIFIC SECTOR(S)</b>	ING-IND/34
<b>HEAD PROFESSOR(S)</b>	VALENZA ANTONINO Professore Ordinario Univ. di PALERMO
<b>OTHER PROFESSOR(S)</b>	
<b>CREDITS</b>	12
<b>INDIVIDUAL STUDY (Hrs)</b>	192
<b>COURSE ACTIVITY (Hrs)</b>	108
<b>PROPAEDEUTICAL SUBJECTS</b>	
<b>YEAR</b>	2
<b>TERM (SEMESTER)</b>	1° semester
<b>ATTENDANCE</b>	Not mandatory
<b>EVALUATION</b>	Out of 30
<b>TEACHER OFFICE HOURS</b>	<b>VALENZA ANTONINO</b> Monday 15:00 16:00 Stanza 319 Edificio & 3 piano Wednesday 15:00 16:00 Stanza 319 Edificio & 3 piano Thursday 9:00 10:00 Stanza 319 Edificio & 3 piano

DOCENTE: Prof. ANTONINO VALENZA

<b>TEACHING METHODS</b>	Front lessons; exercises in class; visits to the Laboratory of Materials of DICAM.
<b>ASSESSMENT METHODS</b>	Oral examination. The interview is aimed at determining the student's ability to process the knowledge gained by using them to solve problems and the ability to express the teaching content using a technically correct language. The vote is expressed in thirtieths with possible praise, according to the scheme reported in the website
<b>LEARNING OUTCOMES</b>	<p>Knowledge and understanding</p> <p>Knowledge regarding:</p> <ul style="list-style-type: none"> <li>- new types of materials with particular reference materials for bioengineering</li> <li>- the correlation between the properties and the various types of materials</li> <li>- the life cycle assessment of materials</li> </ul> <p>The understanding regarding:</p> <ul style="list-style-type: none"> <li>- the interpretation of the properties of materials</li> <li>- the choice of the most suitable methods to choose the materials</li> <li>- identification and methods of materials characterization</li> <li>- the understanding of the most significant characteristics of the materials</li> </ul> <p>Applying knowledge and understanding</p> <p>The skills transferred to the student are:</p> <ul style="list-style-type: none"> <li>- the interpretation of the experimental tests</li> <li>- modeling of the behavior of a composite material under particular stress states</li> </ul> <p>Making judgements</p> <ul style="list-style-type: none"> <li>- The student will have acquired the ability to communicate and express issues involved with innovative materials to be applied in biomedical engineering.</li> <li>- 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.</li> </ul> <p>Communication</p> <ul style="list-style-type: none"> <li>- The student will have acquired the ability to communicate and express issues involved with innovative materials for application in the construction industry.</li> <li>- 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.</li> </ul> <p>Learning skills</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- 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.</li> </ul>
<b>EDUCATIONAL OBJECTIVES</b>	The course aims to provide knowledge about the structure, properties' and technological applications of the main types of materials used in biomedical engineering
<b>PREREQUISITES</b>	<p>Knowing the atomic structure, chemical bonds</p> <p>Understanding the chemical balance and its rules</p> <p>Know how to resolve the acid-base and redox equations</p>
<b>SUGGESTED BIBLIOGRAPHY</b>	Smith "Scienza e Tecnologia dei Materiali" McGraw-Hill

## SYLLABUS

Hrs	Frontal teaching
4	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
10	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
8	Durability of materials
Hrs	Practice
6	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

<b>Hrs</b>	<b>Practice</b>
10	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
8	Determination of loads in a structure in composite material
4	Determination of the viscoelastic behavior of materials
8	Application examples of the materials in the field of bioengineering