UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2017/2018
BACHELOR'S DEGREE (BSC)	BIOMEDICAL ENGINEERING
SUBJECT	TISSUE ENGINEERING
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50301-Ingegneria dei materiali
CODE	18415
SCIENTIFIC SECTOR(S)	ING-IND/22
HEAD PROFESSOR(S)	LA CARRUBBA VINCENZO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**LA CARRUBBA VINCENZO** Tuesday 11:00 12:00 Studio docente, edificio 6 secondo piano Thursday 11:00 12:00 Studio docente, edificio 6 secondo piano

DOCENTE: Prof. VINCENZO LA CARRUBBA

PREREQUISITES	Knowledge of mechanics: - stress/deformation, types of loads (tensile, compressive, shear), mechanical properties Knowledge of thermodynamics - phase diagrams Knowledge of biology - Cell biology, biomacromolecules, central dogma of biology Knowledge of anatomy - types of tissue, skin, long bones, circulatory system (blood vessels), respiratory system (bronchial tube)
LEARNING OUTCOMES	Knowledge and understanding Introducing the tissue engineering and regenerative medicine concept. Define the key concepts of cell biology, bioengineering, istology and anatomy useful for undestanding the tissue engineering and regenerative medicice paradigm. Define properties and features of materials and processes used in tissue engineering. Applying knowledge and understanding Choosing the most appropriate processes and materials for a given tissue engineering application Making judgements Identifying the most important processes and materials for tissue engineering applications, highlighting differences, analogies, advantages and disavantages in a comparative way Communication skills Studente should be able to communicate with competence and language skills about materials and processes for tissue engineering applications, including mechanical properties, biodegradation, surface properties, porosity requirements. Learning skills Students should be able to assess with autonomy a basic tissue engineering problem, with the aim of define the solution strategies
ASSESSMENT METHODS	The final examination consists of a written test followed by an oral examination. The written test, of the duration of about 3 hours, icontains 5 questions concerning all the subjects treated during the course. The oral examination will focus on aspects not sufficiently clarified by the student in the written test. The final assessment, properly graded, will be made on the basis of the following conditions: a) sufficient knowledge of subjects and theories addressed in the course; sufficient degree of awareness and autonomy in the application of theories to solve chemical problems (rating 18-21); b) Good knowledge of subjects and theories addressed in the course; fair degree of awareness and autonomy in the application of theories to solve chemical problems (rating 22-25); c) Good knowledge of subjects and theories addressed in the course; good degree of awareness and autonomy in the application of theories to solve chemical problems (rating 26-28); d) Excellent knowledge of subjects and theories addressed in the course; excellent level of awareness and autonomy in the application of theories to solve problems (rating 29-30L).
EDUCATIONAL OBJECTIVES	1. Introduce the fundamentals of prosthetic systems and regenerative medicine 2. Define the main structural and functional properties of the materials used for regenerative medicine and tissue engineering 3. Scrutinize the main production processes of tissue engineering scaffolds and regenerative medicine devices 4. Selecting the most appropriate production process with respect to a well defined target
TEACHING METHODS	Frontal teaching, Practise, lab experience
SUGGESTED BIBLIOGRAPHY	Scientific articles, book chapters, Reviews and slides supplied in electronic format

SYLLABUS

Hrs	Frontal teaching
4	The History of prosthetic devices, Tissue Engineering and Regenerative Medicine.
8	ntroduction to cell cultures: culture media, growth and differentiation, tissue formation. Types of tissues. Cell-biomaterial interaction. Inflammatory and immunitary response.
4	Tissue Engineering and Regenerative Medicine paradigm: Goals and methods.
9	Introduction to materials applied in biomedical fields: metals, ceramics, polymers. Review of biomaterials and their characteristics
4	Materials used in tissue engineering applications: natural and synthetic polymers
2	Scaffolds for tissue engineering. Strategies for the design.

SYLLABUS

Hrs	Frontal teaching
5	Methods used in tissue engineering (scaffold production)
4	Methods for scaffold production based on phase separation: thermodynamics and kinetic implications
2	Biodegradation issues in tissue engineering: hydrolitic and enzymatic degradation. Biomimetic materials

Hrs	Practice
6	EXamples of in-vitro tissue engineering: skin, blood vessels, bronchiole tube, bone

Hrs	Workshops
6	Case studies of in-vitro tissue engineering: skin, blood vessels, bronchiole tube, bone