



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Ingegneria
<b>ACADEMIC YEAR</b>	2018/2019
<b>MASTER'S DEGREE (MSC)</b>	BIOMATERIALS ENGINEERING
<b>SUBJECT</b>	MATERIALS AND PROCESSING FOR TISSUE ENGINEERING
<b>TYPE OF EDUCATIONAL ACTIVITY</b>	B
<b>AMBIT</b>	50482-Discipline dell'ingegneria
<b>CODE</b>	17947
<b>SCIENTIFIC SECTOR(S)</b>	ING-IND/22
<b>HEAD PROFESSOR(S)</b>	LA CARRUBBA VINCENZO      Professore Associato      Univ. di PALERMO
<b>OTHER PROFESSOR(S)</b>	
<b>CREDITS</b>	6
<b>INDIVIDUAL STUDY (Hrs)</b>	96
<b>COURSE ACTIVITY (Hrs)</b>	54
<b>PROPAEDEUTICAL SUBJECTS</b>	
<b>MUTUALIZATION</b>	
<b>YEAR</b>	2
<b>TERM (SEMESTER)</b>	2° semester
<b>ATTENDANCE</b>	Not mandatory
<b>EVALUATION</b>	Out of 30
<b>TEACHER OFFICE HOURS</b>	<b>LA CARRUBBA VINCENZO</b> 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

<b>PREREQUISITES</b>	Knowledge of mechanics: - stress/deformation, types of loads (tensile, compressive, shear), mechanical properties Knowledge of applied chemistry: - classes of materials, their characteristics and properties Knowledge of thermodynamics - phase diagrams
<b>LEARNING OUTCOMES</b>	Knowledge and understanding Introducing the tissue engineering and regenerative medicine concept. Define the key concepts of cell biology, bioengineering, histology and anatomy useful for understanding the tissue engineering and regenerative medicine 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 disadvantages in a comparative way. Communication skills Students 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 defining the solution strategies
<b>ASSESSMENT METHODS</b>	The final exam consists of the global evaluation of various distinct assignments (for groups of 3-5 students): - one report (max 15-20 pages) on lab activities attended by the students - one assignment (max 25-30 pages) related to a specific design problem of a tissue engineering scaffold, followed by a presentation by the students 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).
<b>EDUCATIONAL OBJECTIVES</b>	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
<b>TEACHING METHODS</b>	Frontal teaching, practise, lab experience
<b>SUGGESTED BIBLIOGRAPHY</b>	Reviews, book chapters, scientific articles and slides supplied in electronic format

## SYLLABUS

Hrs	Frontal teaching
2	The History of prosthetic devices, Tissue Engineering and Regenerative Medicine.
8	Introduction to cell biology and cell cultures: culture media, growth and differentiation, tissue formation. Tissue types. Cell-biomaterial interaction. Inflammatory and immunitary response.
4	Tissue Engineering and Regenerative Medicine paradigm: Goals and methods.
4	Scaffolds for tissue engineering. Strategies for design and production.
9	Introduction to histology and anatomy: skin, cartilage, bone, cardiovascular system (blood vessels) and respiratory system (bronchial tube)
4	Materials used in tissue engineering applications: natural and synthetic polymers
5	Methods used in tissue engineering (scaffold production)
4	Methods for scaffold production based on phase separation: thermodynamics and kinetic implications

## SYLLABUS

Hrs	Frontal teaching
2	Biodegradation issues in tissue engineering: hydrolytic and enzymatic degradation. Biomimetic materials
Hrs	Practice
6	EXamples of in-vitro tissue engineering: skin blood vessels, bronchi, long bones
Hrs	Workshops
6	Case studies of in-vitro tissue engineering: skin, blood vessels, bronchiole tube, bone