



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2015/2016
MASTER'S DEGREE (MSC)	CHEMICAL ENGINEERING
SUBJECT	MATERIALS AND PROCESSES FOR TISSUE AND BIOCHEMICAL ENGINEERING
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50352-Ingegneria chimica
CODE	18071
SCIENTIFIC SECTOR(S)	ING-IND/22
HEAD PROFESSOR(S)	LA CARRUBBA VINCENZO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	144
COURSE ACTIVITY (Hrs)	81
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
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	
LEARNING OUTCOMES	<p>Knowledge and understanding</p> <p>Introducing the tissue engineering and regenerative medicine concept.</p> <p>Define the key concepts of cell biology, bioengineering, histology and anatomy useful for understanding the tissue engineering and regenerative medicine paradigm.</p> <p>Define properties and features of materials and processes used in tissue engineering.</p> <p>Define properties and features of biochemical engineering with reference to physiology.</p> <p>Applying knowledge and understanding</p> <p>Choosing the most appropriate processes and materials for a given tissue engineering application .</p> <p>Describe biochemical processes taking place in physiology by using typical chemical engineering tools.</p> <p>Making judgements</p> <p>Identifying the most important processes and materials for tissue engineering applications, highlighting differences, analogies, advantages and disadvantages in a comparative way.</p> <p>Identifying processes of biochemical engineering and their qualitative and quantitative description.</p> <p>Communication skills</p> <p>Students should be able to communicate with competence and language skills about materials and processes for tissue and biochemical engineering applications, including mechanical properties, biodegradation, surface properties, porosity requirements, physiology description.</p> <p>Learning skills</p> <p>Students should be able to assess with autonomy a basic biochemical and tissue engineering problem, with the aim of define the solution strategies</p>
ASSESSMENT METHODS	Assignment scritti e prova orale
EDUCATIONAL OBJECTIVES	<ol style="list-style-type: none">1. Introduce the fundamentals of prosthetic systems and regenerative medicine2. Define the main structural and functional properties of the materials used for regenerative medicine and tissue engineering3. Scrutinize the main production processes of tissue engineering scaffolds and regenerative medicine devices4. Selecting the most appropriate production process with respect to a well defined target5. Define biochemical processes taking place in physiology and use the appropriate engineering tools to describe them
TEACHING METHODS	Lezioni, esercitazioni, laboratorio
SUGGESTED BIBLIOGRAPHY	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. Cell-biomaterial interaction. Inflammatory and immunitary response.
4	Tissue Engineering and Regenerative Medicine paradigm: Goals and methods.
4	Scaffolds for tissue engineering. Strategies for the design.
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
2	Biodegradation issues in tissue engineering: hydrolytic and enzymatic degradation. Biomimetic materials
14	Introduction to biochemical engineering. Physiology. Transport phenomena in human body and compartment modelling.
Hrs	Practice
6	Case studies of in-vitro tissue engineering: skin, blood vessels, bronchiole tube, bone
13	Examples of Transport phenomena in human body and compartment modelling.
Hrs	Workshops
6	Case studies of in-vitro tissue engineering: skin, blood vessels, bronchiole tube, bone