UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	CHEMICAL ENGINEERING
SUBJECT	MATERIALS AND PROCESSES FOR TISSUE ENGINEERING
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20911-Attività formative affini o integrative
CODE	17581
SCIENTIFIC SECTOR(S)	ING-IND/34
HEAD PROFESSOR(S)	LA CARRUBBA VINCENZO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	108
COURSE ACTIVITY (Hrs)	42
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	TISSUE ENGINEERING - Corso: BIOMEDICAL ENGINEERING TISSUE ENGINEERING - Corso: INGEGNERIA BIOMEDICA
YEAR	2
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	Fundamentals of continuum mechanics: - stress/deformation, types of loads (tensile, compressive, shear), mechanical properties Fundamentals of applied chemistry: - classes of materials, their characteristics and properties Funbdamentals of thermodynamics - phase diagrams
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 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
ASSESSMENT METHODS	The final exam consists of the global evaluation of various distinct assignments (for groups of 3-5 students): - one written report (max 15-20 pages) on lab activities attended by the students (according to the topics listed at the end of this form) - one written assignment (max 25-30 pagine) related to a specific design problem of a tissue engineering scaffold, followed by an oral presentation by the students (see the topics at the end of this form) 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). An evaluation according to the point a, b, c and d will be carried out for item i) and ii), and an arithmetic averaging will be operated with a final round up. The exam and the related evaluation will be the same for non-attending students.
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	Reviews, book chapters, scientifc articles and slides supplied in electronic format

SYLLABUS

Hrs	Frontal teaching
3	The History of prosthetic devices, Tissue Engineering and Regenerative Medicine.
4	Short notes on cell biology and cell cultures: culture media, growth and differentiation, tissue formation. Tissue types. Cell-biomaterial interaction. Inflammatory and immunitary response.

SYLLABUS

Hrs	Frontal teaching
5	Tissue Engineering and Regenerative Medicine paradigm: Goals and methods.
6	Scaffolds for tissue engineering. Strategies for design and production.
5	Short notes on istology and anatomy: skin, cartilage, bone, cardiovascular system (blood vessels) and respiratory system (bronchial tube)
5	Materials used in tissue engineering applications: natural and synthetic polymers
5	Methods used in tissue engineering (scaffold production)
6	Methods for scaffold production based on phase separation: thermodynamics and kinetic implications
3	Biodegradation issues in tissue engineering: hydrolitic and enzymatic degradation. Biomimetic materials

Hrs	Practice
6	Case studies 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