UNIVERSITÀ DEGLI STUDI DI PALERMO

SCHOOL	POLYTECHNIC SCHOOL
ACADEMIC YEAR	2016/2017
FIRST CYCLE COURSE	BIOMEDICAL ENGINEERING
SUBJECT	REGENERATIVE MEDICINE TECHNOLOGIES
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50296-Ingegneria biomedica
CODE	18454
SCIENTIFIC SECTOR(S)	ING-IND/34
HEAD PROFESSOR(S)	
OTHER PROFESSOR(S)	
CREDITS	12
INDIVIDUAL STUDY (Hrs)	192
COURSE ACTIVITY (Hrs)	108
PROPAEDEUTICAL SUBJECTS	
YEAR	3
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	

DOCENTE:

TEACHING METHODS	Frontal teaching, interactive practical sessions, laboratory sessions.
ASSESSMENT METHODS	Students will be evaluated based on a written examination composed of two parts: A) open questions on the course contents randomly selected and covering 20% of the major topics addressed during the frontal teaching and interactive practical sessions. B) numerical problem focusing on notions addressed during the class and particularly during the practical sessions, examples include: engineered scaffold design, bioreactor design, biomaterials selection for endoprosthesis, cell culture/ seeding protocol optimization, tissue growth/scaffold degradation analytical modeling, etc. Each component is scored with a value spanning from 1 to 15. Total maximum mark is therefore equal to 30 and represents the final mark proposed to the student being evaluated. A minimum of 7.5 is required on each component to obtain a pass score. The value on each question is determined based on the student capacity to applied theoretical notions to actual designing tasks such as: biomaterial design, cell culture protocol optimization, biomedical device design. While component A) aims to assess the candidate' capacity to elaborate and formulate independent ideas based on the class' contents, component B) aims to verify engineering and analytical skills. Maximum mark of "30/30 e lode" will be utilized only for individuals who will demonstrate both 1) excellent technical knowledge of the course contents, 2) capacity to think independently and communicate/disseminate results efficiently.
LEARNING OUTCOMES	Technical knowledge Knowledge of regenerative medicine principles, tissue growth and remodeling (Syllabus part 1-8) Knowledge of main tissue specific applications and their limitations , tissue growth and remodeling (Syllabus part 9-20) Applied knowledge Capacity to apply theory and notions to solve real problems such as: design an engineered construct, cell culture protocol optimization, biomedical device design and assessment, endoprosthesis design, tissue growth/material degradation modeling. Independent thinking and creativity Ability to generate novel ideas and to assess the technical and clinical outcomes of a project/task design variables. Communication skills Ability to address technical/scientific questions properly in a highly structured and technology intensive work environment. Ability to communicate technical/scientific notions properly to the lay audience. Learning skills Capacity to access regenerative medicine scientific literature independently. Capacity to access and understand contents of a Regenerative Medicine "second level" class. Capacity to understand basic tasks on a biomedical engineering laboratory.
EDUCATIONAL OBJECTIVES	The overall scope of this course is to provide tools and methods to understand basic notion of design and assessment of regenerative medicine technologies. Examples include: engineered scaffolds, bioreactors, biomaterials, cell culture/ seeding protocols, tissue growth/scaffold degradation analytical models. The main learning objective is to correlate technologies with a specific clinical target so that the trainee would be able to identify major therapies and their correspondent biomaterials and cells types. Basic notions of biomaterials processing, physical-chemical properties, histology, pathology, inflammation and foreign body response will be provided. Cell therapy, biomedical device regulatory process will be addressed as well. Upon course completion, the student will be able to select/asses the suitable
PREREQUISITES	Anatomy & Physiology, Cell biology & Biochemistry, Biomaterials
SUGGESTED BIBLIOGRAPHY	[1] Principles of Tissue Engineering (4th Edition) Edited by:Robert Lanza, Robert Langer and Joseph P. Vacanti ISBN: 978-0-12-398358-9 [2] Tanzi Maria Cristina, Bianchi Annamaria, Fare' Silvia, Mantero Sara, Raimondi Manuela Teresa, Visai Livia, Approccio integrato per la medicina rigenerativa, Editore: Patron, Anno edizione: 2013, ISBN: 9788855532419 [3] Mantero Sara, Remuzzi Andrea, Raimondi Manuela Teresa, Ahluwalia Arti, Fondamenti di ingegneria dei Tessuti per la medicina rigenerativa Editore: Patron, Anno edizione: 2009, ISBN: 9788855530392

SYLLABUS

Hrs	Frontal teaching
10	Part 1: Introduction to Regenerative Medicine Part 2: The Basis of Growth and Differentiation Part 3: In Vitro Control of Tissue Development Part 4: In Vivo Synthesis of Tissues and Organs
15	Part 5: Biomaterials in Tissue Engineering and Regenerative Medicine Part 6: Transplantation of Engineered Cells and Tissues Part 7: Stem Cells Part 8: Gene Therapy Part 7: Stem Cells Part 8: Gene Therapy
43	Part 9: Breast Part 10: Cardiovascular System Part 11: Endocrinology and Metabolism Part 12: Gastrointestinal System Part 13: Hematopoietic System Part 14: Kidney and Genitourinary System Part 15: Musculoskeletal System Part 16: Nervous System Part 17: Ophthalmic Part 18: Oral/Dental Applications Part 19: Respiratory System Part 20: Skin
10	Part 21: Clinical Experience Part 22: Regulation, Commercialization and Ethics

Hrs	Practice
6	Practical exercise on tissue growth modeling
14	Practical exercise on regenerative medicine designing (e.g. process, prosthesis, biomedical device)

Hrs	Workshops
10	Laboratory visit and applications on cell/tissue characterization or material processing