



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Ingegneria
<b>ACADEMIC YEAR</b>	2021/2022
<b>BACHELOR'S DEGREE (BSC)</b>	BIOMEDICAL ENGINEERING
<b>SUBJECT</b>	BIOMEDICAL DEVICES
<b>TYPE OF EDUCATIONAL ACTIVITY</b>	B
<b>AMBIT</b>	50296-Ingegneria biomedica
<b>CODE</b>	21192
<b>SCIENTIFIC SECTOR(S)</b>	ING-IND/34
<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>	3
<b>TERM (SEMESTER)</b>	1° 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>	Fundamentals of materials science and technology - classes of materials, their characteristics and properties Fundamentals of anatomy and physiology - respiratory, vascular, musculoskeletal systems
<b>LEARNING OUTCOMES</b>	<p>Knowledge and understanding Introduction to the concept of biomedical device. Definition of the key concepts of cell biology, bioengineering, histology e anatomy and physiology useful for understanding the paradigm of biomedical device. Recall of the properties and characteristics of materials that can be used for biomedical devices to be used in clinical applications.</p> <p>Ability to apply knowledge and understanding Choice of the most appropriate processes and devices for a given biomedical device to be used in clinical applications</p> <p>Autonomy of judgment Identification of the most important characteristics and materials for biomedical devices, highlighting differences, similarities, advantages and disadvantages in a comparative way.</p> <p>Communication skills Students will be able to communicate with competence and scientific language the working principles of a biomedical devices, by using the appropriate engineering and medical lexicon.</p> <p>Learning skills Students will be able to address with a sufficient level of autonomy an anatomical/physiological issue that requires the use of a biomedical device, identifying the most suitable strategies for its choice and implementation in the clinical field</p>
<b>ASSESSMENT METHODS</b>	<p>The final examination consists of a written test followed by an oral examination. The written test, of the duration of about 3 hours, contains 3-5 open 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:</p> <p>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);</p> <p>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);</p> <p>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);</p> <p>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).</p> <p>The exam and the related evaluation will be the same for non-attending students.</p>
<b>EDUCATIONAL OBJECTIVES</b>	<ol style="list-style-type: none"> <li>1. Introduce the fundamentals of prosthetic systems</li> <li>2. Define the main structural and functional properties of the materials used for biomedical devices</li> <li>3. Review the main biomedical devices used in various zones of the human body</li> <li>4. Choose the most appropriate device for the targeted anatomical district</li> </ol>
<b>TEACHING METHODS</b>	Frontal teaching, practise
<b>SUGGESTED BIBLIOGRAPHY</b>	<p>Medical Device Technologies A system based overview using engineering standards. Edited by: Baura G.D. Elsevier ISBN: 978-0-12-374976-5</p> <p>Reviews, book chapters, scientific articles and slides supplied in electronic format</p>

## SYLLABUS

Hrs	Frontal teaching
4	Introduction to biomedical devices, engineering in diagnosis and therapeutic treatments
4	Differences between intra-, extra-, para-corporeal devices
5	Overview of biomedical devices and artificial organs (cardiovascular, musculoskeletal, respiratory and other body areas)
6	Cardiac pacing systems, defibrillators (external and internal), pacemakers, stents, endoprostheses, catheters, mechanical and surgical valves, LVAD cardiovascular assist devices
4	Knee, hip and shoulder prosthetics
4	Mechanical ventilation, artificial lungs

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<b>Hrs</b>	<b>Frontal teaching</b>
4	Artificial kidney, Transjugular Intrahepatic Porto-systemic Shunt (TIPSS) of the liver
6	Orthodontic implants, breast implants, ocular implants and cochlear implants
4	Notes on the functioning of rehabilitation robotics, robotic surgery and minimally invasive surgery, computer-assisted surgery, wearable devices and ICT solutions
<b>Hrs</b>	<b>Practice</b>
13	Examination of case studies related to biomedical devices