



BIOMACHINES

Enrollment year	2021/2022
Academic year	2021/2022
Regulations	DM270
Academic discipline	ING-IND/34 (INDUSTRIAL BIOENGINEERING)
Department	DEPARTMENT OF ELECTRICAL, COMPUTER AND BIOMEDICAL ENGINEERING
Course	BIOENGINEERING
Curriculum	Cellule, tessuti e dispositivi
Year of study	1°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	9
Lesson hours	83 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	CONTI MICHELE (titolare) - 9 ECTS
Prerequisites	Knowledge of the principles of fluid mechanics (Physics) and the differential equations at partial derivatives.
Learning outcomes	<p>At the end of the course the student will have acquired:</p> <ul style="list-style-type: none">- fundamentals of fluid-dynamics;- a basic knowledge of the circulatory system and physiology;- operating principles of the life support systems commonly used in clinical practice for hemodialysis and extra-body circulation;- principles of modeling of the circulatory system is one-dimensional that three-dimensional, with hints on computational tools;- overview of heart valve prostheses.

Course contents	<p>Fundamentals of fluid dynamics; Recalls of anatomy of the vascular system; Physiology and pathology of the circulatory system; Blood rheology; Principles of arterial waves; Modeling and simulation of the circulatory system; Reduced models of the cardiovascular system; 3D models and computational tools: introduction 3D models and computational tools: analysis set-up; Creations of vascular models from medical images; 3D models and computational tools: applications; Extra-corporeal circulation (ECMO); Hemodialysis machines and circuits; Ventricular assistance; Biological and mechanical valve prostheses.</p>
Teaching methods	<p>taught lessons also with the support of multimedia devices; practical exercises and / or numerical in the classroom equipped with a computer</p>
Reccomended or required readings	<p>Course notes on Kiro platform. Lecture suggerite: - Nichols W, O'Rourke M, Vlachopoulos C, editors. McDonald's blood flow in arteries: theoretical, experimental and clinical principles. CRC press; 2011 Jul 29. - Caro CG. The mechanics of the circulation. Cambridge University Press; 2012. - Kundu, P.K., Cohen, I.M.. Fluid Mechanics. Elsevier. In particolare il capitolo "Introduction to Biofluid Mechanics". - Miller, G.E.. Artificial Organs. Morgan & Claypool.</p>
Assessment methods	<p>The exam will be passed after a positive oral exam concerning the contents of the course and the simultaneous discussion of a project focused on the application of the acquired principles; there is also a computer test regarding the fluid dynamics simulation of a case study in the biomedical field.</p>
Further information	
Sustainable development goals - Agenda 2030	<p>The goals</p>