



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Ingegneria
<b>ACADEMIC YEAR</b>	2020/2021
<b>BACHELOR'S DEGREE (BSC)</b>	BIOMEDICAL ENGINEERING
<b>SUBJECT</b>	BLOOD AND PLASMA SEPARATION AND PROCESSING
<b>TYPE OF EDUCATIONAL ACTIVITY</b>	D
<b>AMBIT</b>	10437-A scelta dello studente
<b>CODE</b>	21188
<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>	2
<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>	Physics, Mathematics
<b>LEARNING OUTCOMES</b>	<p>Knowledge and understanding                      Knowledge of the basic principles of hematology. Knowledge of the main technologies for the treatment of blood and devices for rapid screening of disease diagnostic.</p> <p>Ability to apply knowledge and understanding                      Ability to apply the notions learned to real problems such as: design of an engineered device for specific diagnostic needs, sizing of the necessary unit operations, the choice of materials, the choice of strategies for separating red blood cells from plasma, analytical resolution fluid dynamics applied to microsystems for the treatment of blood.</p> <p>Autonomy of judgment                      Autonomy in operating and evaluating the implications of the choices made in technological terms and their clinical impact.</p> <p>Communication skills                      Ability to face a technical-scientific discussion in a structured context of high educational level aimed at the implementation or design of processes or biomedical devices. Ability to deal with the same issues in a context of a non-expert audience.</p> <p>Learning skills                      Ability to update through independent consultation of scientific publications of the Biomedical Engineering sector. Ability to follow, using the knowledge acquired in the course, second level courses, specialized in the sector and to understand elementary tasks in an biomedical engineering laboratory.</p>
<b>ASSESSMENT METHODS</b>	The final exam consists of a written test followed by an oral test. The written test, lasting about 2 hours, will contain from 2 to 3 open-ended questions concerning all the topics covered in the course, followed by an oral test, which will focus on topics for which the written test answers are been insufficient and / or on topics not covered in the written test.
<b>EDUCATIONAL OBJECTIVES</b>	<p>The general purpose of the course is to introduce the student to the understanding, design and evaluation of technologies in the field of applied hematology, such as systems for separating red blood cells from blood on macro and microscale for specific diagnostic applications.</p> <p>The primary objective is to correlate the technologies to a specific objective in the clinical setting and provide the student with the basic elements to identify the most suitable diagnostic classes and corresponding solutions.</p> <p>At the end of the course the student must be in a position to choose the most suitable blood treatment strategy based on the clinical needs</p>
<b>TEACHING METHODS</b>	Lessons
<b>SUGGESTED BIBLIOGRAPHY</b>	<p>Rodak's Hematology (6th Edition)                      Edited by: Elaine M. Keohane, Catherine N. Otto, and Jeanine M. Walenga, Springer, 2019                      ISBN: 9780323530453</p> <p>Paper Microfluidics: Theory and Applications (Advanced Functional Materials and Sensors) Edited by: Shantanu Bhattacharya • Sanjay Kumar • Avinash K. Agarwal                      ISBN: 978-981-15-0488-4</p>

### SYLLABUS

Hrs	Frontal teaching
4	Introduction: History Red Blood Cells, White Blood Cells, Platelets and plasma components Complete Blood Count Hematopoietic development
4	Overview of Cellular Structure and Function Hemoglobin Structure and Function
4	Blood Coagulation and Blood–Material Interactions
6	Basic Haematological Techniques Manual, Semiautomated, and Point-of-Care Testing in Hematology
5	Fluid Transport Mechanisms in Paper-Based Microfluidic Devices
6	Fabrication Techniques for Paper-Based Microfluidic Devices
5	Flow Control in Paper-Based Microfluidic Devices
5	Paper Microfluidic Based Device for Blood/Plasma Separation
5	Evolution of Paper Microfluidics as an Alternate Diagnostic Platform

## SYLLABUS

<b>Hrs</b>	<b>Frontal teaching</b>
5	Paper Microfluidic-Based Devices for Infectious Disease Diagnostics
5	Microfluidic devices for the preparation of blood plasma samples in circulating nucleic acid based medical applications