UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
BACHELOR'S DEGREE (BSC)	BIOMEDICAL ENGINEERING
SUBJECT	BLOOD AND PLASMA SEPARATION AND PROCESSING
TYPE OF EDUCATIONAL ACTIVITY	D
AMBIT	10437-A scelta dello studente
CODE	21188
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)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° 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	Physics, Mathematics
LEARNING OUTCOMES	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. 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. Autonomy of judgment Autonomy in operating and evaluating the implications of the choices made in technological terms and their clinical impact. 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. 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.
ASSESSMENT METHODS	The final examination consists of a written test followed by an oral examination. The written test, of the duration of about 2 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 and/or on further subjects of the course. 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). The exam and the related evaluation will be the same for non-attending students.
EDUCATIONAL OBJECTIVES	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. 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. 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
TEACHING METHODS	Lessons
SUGGESTED BIBLIOGRAPHY	Rodak's Hematology (6th Edition) Edited by: Elaine M. Keohane, Catherine N. Otto, and Jeanine M. Walenga, Springer, 2019 ISBN: 9780323530453 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

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
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