UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2021/2022
BACHELOR'S DEGREE (BSC)	BIOMEDICAL ENGINEERING
SUBJECT	BIOMATERIALS TRANSFORMATION- BIOMATERIALS WORKSHOP
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50301-Ingegneria dei materiali
CODE	18478
SCIENTIFIC SECTOR(S)	ING-IND/22
HEAD PROFESSOR(S)	MISTRETTA MARIA CHIARA — Ricercatore a tempo determinato — Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	144
COURSE ACTIVITY (Hrs)	81
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**MISTRETTA MARIA CHIARA** Tuesday 10:00 11:00 Terzo piano Ed.6 Thursday 10:00 11:00 Terzo piano Ed.6

DOCENTE: Prof.ssa MARIA CHIARA MISTRETTA

PREREQUISITES	In order to understand the topics and to easily achieve the learning goals of the teaching course, the student must be confident with the subjects in the area of Chemistry, Material Science and Technology, Transport Phenomena and Termodynamics.
LEARNING OUTCOMES	Knowledge and understanding ability The student, at the end of the teaching class, will possess knowledge of the main questions regarding characteristics, properties, processing, application fields of the most common biomaterials. Particular attention will be paid to typical engineering questions (design and verification) connected with the described processes and the consequent characterization tests. Ability to apply knowledge and understanding The student will be able to describe and use the different biomaterials studied in the course to evaluate which is the best to realize a certain object-device. The student will also be able to identify the possible interactions and synergy among different biomaterials to optimize the performance of an object-device. Judging autonomy The student will be able to interpret known data on materials in order to evaluate the range of their applicability. The student will be also able to recognize and acquire all the properties of a material necessary for the implementation/solution of design-verification problems. Communication ability The student will acquire the capability to communicate and express problems inherent the course topics. The student will be able to highlight questions related to the preparation and processing of different materials, to their lifetime behavior, by proposing solutions to solve possible shortcomings and critically assessing their effectiveness. Learning ability At the end of the course, the student will have learnt how to choose the most suitable material for a certain application, by evaluating properties in connection with the functions of the object-device. This will allow acquiring autonomy and awareness to be able to make supported choices when realizing potential projects.
ASSESSMENT METHODS	The evaluation will be based on a written test consist in a test containing six questions (to be answered openly) in a maximum time of 3 hours. The exam aims to evaluate some basic competences and problem solving capability of the student. The stimuli, well defined, clear and univocally interpretable allow formulating the answer in full autonomy. Moreover, they are structured in order to allow the comparability. The oral examination consists of an interview to assess the competences and the knowledge learnt during the course. The questions will verify: acquired knowledge; elaboration capability; talking capability; ability to build autonomous connections not bound to the referring textbooks; capability to produce autonomous evaluations inherent the course topics; capability to understand the applications connected with the discipline areas; capability to connect the discipline topics with the referring professional and technological context. The final assessment is on a 30 basis according to the criteria reported below: 30-30+: excellent knowledge of the topics, excellent language and vocabulary, good analytical capability, the student is able to apply knowledge to solve the proposed problems 26-29: Good management of the topics, nice language and vocabulary, the student is able to apply knowledge to solve the proposed problems 24-25: basic knowledge of the topics, fair language and vocabulary, limited capability to apply autonomously knowledge to solve the proposed problems 21-23: the student does not show full management of the main topics while possessing the knowledge, satisfactorily language and vocabulary, poor capability to apply autonomously the acquired knowledge 18-20: minimal basic knowledge of the main topics and of the technical language and vocabulary, poor or no capability to apply autonomously the acquired knowledge. The exam will be not passed if the student will show a not acceptable knowledge of the topics.
EDUCATIONAL OBJECTIVES	The course aims to introduce the main characteristics and properties of polymeric, ceramic and metal biomaterials used in the biomedical field. In particular, the chemical characteristics, mechanical properties and rheological properties of polymeric materials will be studied in order to be able to know the

	main property-structure relationships and applications in the biomedical field. Similarly, the chemical characteristics and properties of the main metallic materials used in the biomedical field will be studied by comparing them. Finally the main ceramic materials used in the biomedical field will be studied with reference to the different applications.
TEACHING METHODS	Lectures
SUGGESTED BIBLIOGRAPHY	Biomaterials Science – An introduction to Materials in Medicine. Third Edition, Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, Jack E. Lemons. Elsevier, ISBN 978-0-12-374626-9 W. Smith, J. Hashemi - "Scienza e Tecnologia dei Materiali", MacGraw–Hill, ISBN 978-88-386-6765-7

SYLLABUS

Hrs	Frontal teaching
2	Introduction to biomaterials
6	Solid state properties of polymeric materials
7	Viscoelasticity. Maxwell and Kelvin-Voigt models
4	Rheology of polymeric systems
6	Shear flow rheology. Non Newtonianism. Elongational flow rheology
12	Applications of polymeric materials in the biomedical field
4	Degradation of polymeric materials
2	Typical polymer processing methodologies
2	Applications of metallic materials in the biomedical field
8	Ferritic, martensitic, austenitic stainless steels
6	Titanium and its alloys
6	Chromium-Cobalt alloys
6	Notes on corrosion of metallic materials
6	Ceramic materials: bio-inert ceramic, surface reactivity and bioabsorbable
4	Applications of ceramic materials in the biomedical field