UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè		
ACADEMIC YEAR	2020/2021		
BACHELOR'S DEGREE (BSC)	OPTICS AND OPTOMETRY		
INTEGRATED COURSE	CHEMICAL PRINCIPLES AND TECHNOLOGIES FOR MATERIALS - INTEGRATED COURSE		
CODE	20246		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	ING-IND/16, CHIM/02		
HEAD PROFESSOR(S)	MILIOTO STEFANA	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)	PALMERI DINA	Ricercatore a tempo determinato	Univ. di PALERMO
	CAVALLARO GIUSEPPE	Ricercatore a tempo determinato	Univ. di PALERMO
CREDITS	9		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	3		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**CAVALLARO GIUSEPPE** Monday 11:00 12:00 Studio del dott. Giuseppe Cavallaro (1/B22) viale delle scienze pad. 17 Wednesday 11:00 12:00 Studio del dott. Giuseppe Cavallaro (1/B22) viale delle scienze pad. 17 Friday 11:00 12:00 Studio del dott. Giuseppe Cavallaro (1/B22) viale delle scienze pad. 17 **MILIOTO STEFANA** Monday 14:30 15:30 Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze Wednesday 14:30 15:30 Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze Friday 14:30 15:30 Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze **PALMERI DINA** Wednesday 15:00 18:00 Stanza del docente Thursday 15:00 18:00 Stanza del docente		

DOCENTE: Prof.ssa STEFANA MILIOTO

PREREQUISITES	The required prerequisites to guarantee that the course is profitable for the students deal with the knowledge of topics learnt into the course of Chemistry Fundamentals, Physics I and Laboratory of Geometric Optics.
LEARNING OUTCOMES	KNOWLEDGE AND CAPACITY OF COMPREHENSION The student has to know the fundamentals of physical chemistry of materials such as glass (mechanical, optical properties) and polymers (degree of crystallization, molecular weight) functional to optics as well as physico-chemical characteristics of contact lenses and the experimental methods to determine them. He has to know the most important applications of innovative technologies of 3D printing. On the basis of the acquired knowledge, the student will improve his skill on the physical chemistry and he will be able to understand the relationships between the molecular and the macroscopic properties of materials functional to optics as well as the aspects on 3D innovative technologies. CAPACITY TO APPLY KNOWLEDGE AND COMPREHENSION The student has to be able to apply concepts, techniques and physico-chemical methodologies to issues related to materials for optics and the related aspects to the innovative processes. JUDGEMENT The student has to possess skills in interpreting and evaluating data related to the physico-chemical properties of materials for optics and related issues on teh 3D printing demonstrating capacity of independent judgment in assessing and quantifying the experimental results. ABILITIES FOR COMMUNICATION The student has to be able to describe in a clear and rigorous manner the acquired topics as part of activities and professional relationships. Assessment of the achievement of such capacities takes place through the oral examination where the ability, fairness and rigor in the exposition are also evaluated. LEARNING CAPACITY The student has to be able to update and to adapt, in an independent way, the physico-chemical approaches and the 3D innovative applications acquired during the course to higher level of knowledge.
ASSESSMENT METHODS	The student evaluation is done through a colloquium on the reports on the data acquired from the experiments of the laboratory activities performed within the Laboratory of chemistry of materials for optics section and on the topics treated in the 3D printing section. The colloquium will ascertain the competences possession and knowledge of the course disciplines as well as the skill of the scientific language and the exposure abilities. The final evaluation predicts different classes as described in the following: 1) Basic knowledge of course topics and limited capacity of knowledge processing and of correlation among the various topics. Sufficient capacity analysis of the proposed phenomena. Reduced ability of judgement and of exposure of the pursued procedures (rating 18-21) 2) Good knowledge of course topics and good capacity of knowledge processing and of correlation among the various topics. Good capacity of analysis of the proposed phenomena. Good ability of judgement and of exposure of the pursued procedures (rating 22-24) 3) Very good knowledge of course topics and rather good ability of knowledge processing and of correlation among the various topics. Really good capacity of analysis of the proposed phenomena. Really good ability of judgement and of exposure of the pursued procedures (rating 25-27) 4) Excellent knowledge of the topics, excellent and prompt capacity of knowledge processing and of correlation among the various topics by applying the acquired knowledge even to contests different from those proper of the course. Very good capacity of analysis of the proposed phenomena. Very good judgement and exposure ability of the pursued procedure (rating 28-30) 5) Excellent knowledge of the topics, excellent and very smart capacity of processing knowledge and of correlation among the various topics by applying the acquired knowledge even to contests different from those proper of the course. Excellent capacity of analysis of the proposed phenomena. Excellent judgement ability and of exposure of the pursued procedure (rating 30 cum laude)
TEACHING METHODS	The course is given through lectures and experiments performed in laboratory. The laboratory hours are mandatory. The maximum admissible limit for

	absences occurred during mandatory laboratory hours is 25%.

MODULE
CHEMISTRY OF MATERIALS FOR OPTICS - LABORATORY

Prof. GIUSEPPE CAVALLARO

SUGGESTED BIBLIOGRAPHY

LaC - Proprieta' fisico-chimiche, Abati, S.; Farini, A.; Stefanelli, M., Fabiano Editore (2001).
P. C. Hiemenz, Principles of Colloid and Surface Chemistry, Marcel Dekker, III Edizione (1997)
D. W. Oxtoby, H. P. Gillis, H. H. Helal, K. P. Gaither, Chimica Moderna, Edises, IV Edizione (2012)

AMBIT	10699-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	82
COURSE ACTIVITY (Hrs)	68

EDUCATIONAL OBJECTIVES OF THE MODULE

The module aims to introduce basic physico-chemical concepts on materials of interest for optics, such as glass and polymers, and to carry out experiments in the laboratory aimed at characterizing physico-chemical properties of polymers and materials used in lenses of contact.
Each student will carry out five experiments. The proposed approach is based on problem-solving. The results of the experiences will be discussed through a circular didactic approach.

SYLLABUS

Hrs	Frontal teaching
1	Aims of the course
1	Glass. Composition and role of oxides.
1	Glass. Optical, mechanical, chemical properties.
1	Polymers: definition and classification. Cristalline, semi-cristalline and amorphous polymers.
2	Polymers: degree of polimerization, molecular weight, polidispersity. Thermosensitive polymers.
2	Contact lens properties: hydration, wetting, surface properties, mechanical properties.

Hrs	Workshops
12	Determination of contact angle: performing the experiment, the data analysis involving the application of errors theory and elaboration of a report. Discussion of results.
12	Solute surface excess determination: performing the experiment, the data analysis involving the application of errors theory and elaboration of a report. Discussion of results.
12	Determination of average molecular weight of the polymer. Performing the experiment, the data analysis involving the application of errors theory and elaboration of a report.Discussion of results
12	Cristallinity determination of a polymer: performing the experiment, the data analysis involving the application of errors theory and elaboration of a report. Discussion of results.
12	Hydration determination of materials used in soft contact lenses: performing the experiment, the data analysis involving the application of errors theory and elaboration of a report. Discussion of results.

MODULE
3-D PRINTING

Prof.ssa DINA PALMERI

SUGGESTED BIBLIOGRAPHY	
Ian Gibson, David Rosen, Brent Stucker. Additive Manufacturing Technologies 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, second edition, Springer, 2015.	
AMBIT	10699-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	47
COURSE ACTIVITY (Hrs)	28
EDUCATIONAL OBJECTIVES OF THE MODULE	
The course aims at providing the students with knowledge concerning manufacturing processes with particular attention to additive manufacturing processes and 3-d printing technologies. Case studies and laboratory applications will be developed.	

SYLLABUS

Hrs	Frontal teaching
2	Introduction
3	Materials
8	Additive manufacturing
3	3D printing application

Hrs	Workshops
12	3d printing laboratory experience