UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2021/2022
BACHELOR'S DEGREE (BSC)	OPTICS AND OPTOMETRY
SUBJECT	ELEMENTS OF BIOPHYSICS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50161-Sperimentale e applicativo
CODE	17196
SCIENTIFIC SECTOR(S)	FIS/07
HEAD PROFESSOR(S)	MILITELLO VALERIA Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**MILITELLO VALERIA** Monday 15:00 17:00 Ufficio personale al primo piano dell'Edificio 18 Viale delle Scienze. Si prega di contattarmi preventivamente via email per conferma.

DOCENTE: Prof.ssa VALERIA MILITELLO

PREREQUISITES	It's necessary to have knowlege of Biochemistry, Physics I, Physics II and Modern Physics
LEARNING OUTCOMES	Knowledge and ability to understand: the student must to know the composition of the biological matter from the atom to the cells, and understand the relationship between structure, function and dynamics in organic molecules; the student must to know information on the effects of the interactions between the molecules and the surrounding environment and between the light and the biological matter. Capacity to apply knowledge and understanding: the students must know the application of the concepts listed above recognizing which spectroscopic technique, and related instruments, should be used to obtain specific information; the student must know technical scheme and mode of operation of the instruments studied; the students must to build and distinguish graphs and spectra analysis methodologies; the students have to know information about new frontiers of experimental biophysics and its applications. Independent judgments: the student must get independent judgment in the evaluation and interpretation of experimental data taken from the specialized scientific literature. Communicative comprehension: the student have to acquire skills and tools for presenting experimental and bibliographic data. Learning Capacity: development and deepening of the acquired knowledges by consulting databases and research of recent literature on a chosen topic.
ASSESSMENT METHODS	Exam: oral discussion. The exam is intended to assess whether the student possesses knowledge and understanding of the teaching program topics, independent judgment, ability to apply the acquired knowledges, discipline-specific language. Minimum number of questions: for passing the exam, the student will have to answer to a minimum of three questions, which will cover all the topics of the teaching program, with reference to the recommended texts. Evaluation and its criteria: the evaluation is shown in the diagram below. A – A+ Excellent 30-30 cum laude Eccellente Excellent knowledge of teaching contents; students should show high analytical and synthetic capabilities and should be able to apply their knowledge to solve highly complex problems. B Very good 27-29 Ottimo Very good knowledge of the teaching contents and excellent language control; students should show analytical and synthetic skills and be able to apply their knowledge to solve problems of medium and, in some cases, even higher complexity. C Good 24- 26 Buono Good knowledge of teaching contents and good language control; the students should be able to apply their knowledge to solve problems of medium complexity D Satisfactory 21-23 Discreto Average knowledge of the teaching contents, in some cases limited to the main topic; acceptable ability to use the specific discipline language and independently apply the acquired knowledge. E Sufficient 18-20 Sufficiente Minimum teaching content knowledge, often limited to the main topic; modest ability to use the subject specific language and independently apply the acquired knowledge. F Fail Insufficiente Lack of an acceptable knowledge of the main teaching content knowledge; very little or no ability to use the specific subject language and apply independently the acquired knowledge.
EDUCATIONAL OBJECTIVES	At the end of the course the students should be able to: - understand the basic principles about the composition of the biological matter and its properties; - know the effects due to the interaction light-matter; - understand the basic principles of optical spectroscopy; - know the principles which support some of the most common biomedical technologies and distinguish their use; - know the technical scheme and specific mode of operation of the instruments studied. The course is divided into a theoretical part and an experimental part through visiting laboratories of Biophysics at the Department DIFC with the aim to take vision and try some instruments studied.
TEACHING METHODS	

	lessons and laboratory. According to what was established in the meeting of the Organizing Committee on 05/07/2019, the laboratory hours are mandatory. The organizing committee has set the maximum admissible limit for absences occurred during mandatory laboratory hours at 25%.
SUGGESTED BIBLIOGRAPHY	Giancoli DC "Fisica con Fisica moderna" Casa Ed Ambrosiana, Terza Edizione, ISBN: 9788808186102 Serway & Jewett "Principi di Fisica" Volume II EdiSES, Quarta Edizione, ISBN: 8879594249 Halliday, Resnick, Walker “Fondamenti di Fisica - Fisica Moderna” Casa Ed Ambrosiana, Quinta Edizione, ISBN: 8840812032

SYLLABUS

Hrs	Frontal teaching
4	Molecular Biophysics: structure of biological matter, from the atom to the cells. Solvent properties. The water. Interaction between molecules and solvent. Cellular Biophysics: the cell and its components. Cellular membrane and exchanges with environment. Neurons and electric transmission.
6	Structures of proteins and biopolymers. Relationship between structure, function and dynamics of proteins. Energy Landscapes. Aggregation and polymerization of natural and artificial macromolecules. Nucleic Acids.
6	Folding and unfolding of proteins. Activation energies. Levinthal paradox. Molecular bonds. Energies and bonding forces.
4	Elements of Optical Spectroscopy. Fotons and waves of matter. Light-matter interaction. Energy levels and their populations. Atomic and molecular spectra.
4	Electronic transitions, vibrational, rotational. Absorption and emission of photons.
4	X-ray diffraction and molecular structure. Light Scattering.
4	LASER. Optical and advanced microscopy.
4	Infrared Spectroscopy: FTIR and ATR
4	New Frontiers in Biophysics: Nanotechnology. Biomaterials and their properties. Examples and recent literature.

Hrs	Workshops
8	Experimental part: instruments and experimental techniques. Technical scheme of instrumentation used in UV-VIS absorption and emission spectroscopy and optical fluorescence microscopy. Graphical representation of spectra. Analysis of the experimental data in spectroscopy. Experimental errors.
4	visit in laboratories to know and test some of the instruments studied.