UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2020/2021
BACHELOR'S DEGREE (BSC)	OPTICS AND OPTOMETRY
SUBJECT	PRINCIPLES OF MODERN PHYSICS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50162-Microfisico e della struttura della materia
CODE	20233
SCIENTIFIC SECTOR(S)	FIS/03
HEAD PROFESSOR(S)	NAPOLI ANNA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	100
COURSE ACTIVITY (Hrs)	50
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**NAPOLI ANNA** Monday 15:00 16:30 Dipartimento di Fisica e Chimica, stanza 122, Via Archirafi 36 Friday 14:30 16:00 Dipartimento di Fisica e Chimica, stanza 122, Via Archirafi 36

DOCENTE: Prof.ssa ANNA NAPOLI

PREREQUISITES	Students are supposed to be familiar with basic concepts of classical mechanics and with appropriate mathematical tools
LEARNING OUTCOMES	Knowledge and Comprehension: students, at the end of the course, will have learned phenomena concerning radiation-matter interaction described by Maxwell equations, principles of Relativity and basic elements of Quantum Mechanics. Ability to apply knowledge and comprehension: students will be able to identify, describe and analyze phenomena in the context of modern physics exploiting the relevant fundamental laws. Student will have also the ability to apply the basic laws of Relativity and Quantum Mechanics to solve simple problems. Making Judgements: students will be able to recognize and classify physical phenomena of interest, to choose autonomously the way to solve simple problems, and the laws to apply. In order to achieve this, students will have to interact both with other students and the teacher by presenting and discussing specific physical situations in modern physics. Communication skills: students will be able to expose clearly and synthetically the fundamental laws of Relativity and Quantum Mechanics also connecting them with topics external to the course. In order to achieve this students are actively involved in discussing and solving particular physical problems. Learning skills: at the end of the course students will acquire a method for the study of physical processes that can be useful in further applications and in depth studies. Such skills will be developed in particular through discussions and classroom exercises.
ASSESSMENT METHODS	The final examination consists of a discussion on the topics developed during the course and the resolution of simple problems; besides verifying the candidate's knowledge, the discussion allows the evaluation of his ability of using a clear, thus appropriate, language. The overall evaluation will be as follows: -Insufficient (exam not passed) if the candidate does not show an acceptable knowledge of the contents of the course. - Sufficient (mark 18-20) if the candidate shows a sufficient knowledge of the contents of the course but a limited ability of both exposition of the concepts and application of the methods. - Satisfactory (mark 21-23) if the candidate exhibits sufficient knowledge of the contents, sufficient ability of exposition of the concepts and sufficient ability of application of the methods. - Good (mark 24-26) if the candidate exhibits good knowledge of the contents, sufficient ability of exposition and sufficient ability to apply the methods. -Very good (27-29) if the candidate exhibits good knowledge of the contents, good ability of exposition, and fairly good ability of application of the methods. -Excellent (mark 30-30 cum laude) if the candidate exhibits excellent knowledge of the concepts, excellent ability of exposition and the ability to apply autonomously the methods
EDUCATIONAL OBJECTIVES	Introducing the main phenomena and the fundamentals of the theory of Relativity and Quantum Mechanics characterizing the physics of the 20th century, highlighting the changes in the interpretation of the phenomena with respect to classical physics.
TEACHING METHODS	The teaching is organized in lectures and practical classes. Simple classroom exercises are performed to test the skills' reached by the student in the application of acquired knowledge and are a useful training to the final exam.
SUGGESTED BIBLIOGRAPHY	D. HALLIDAY, R. RESNICK, J. WALKER: Fondamenti di Fisica - Fisica Moderna; Casa Editrice Ambrosiana GIANCOLI, Fisica con Fisica Moderna, Casa Editrice Ambrosiana. SERWAY, JEWETT, Principi di Fisica, vol. II, EdiSES.

SYLLABUS

Hrs	Frontal teaching
6	Introduction to Electromagnetism, mechanical waves and electromagnetic waves. Reference Frames and Galilean transformations.
2	Michelson and Morley experiment and Lorentz transformations
8	Postulates of Special Relativity. Time and length in Relativity theory. Relativity of simultaneity. Velocity Addition. Mass, energy and momentum in Relativity theory. Relativistic dynamics
4	Blackbody Radiation. The Photoelectric Effect. Compton effect
6	Planck and Einstein hypothesis. Photon. Energy and momentum of a photon. The Bohr atom. De Broglie's wavelength. Wave-particle duality.
2	Wave function and probability amplitude. Schrodinger's equation.

SYLLABUS

Hrs	Frontal teaching
6	Particle in a potential well. Free particle. Tunnel effect.
6	Measurement in quantum mechanics.The Heisenberg's Uncertainty Principle. Angular momentum and spin.

Hrs	Practice
4	Simple problems in the context of Relativity theory
6	Simple problems in the context of Quantum Mechanics