UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	OPTICS AND OPTOMETRY
SUBJECT	PHYSICS I
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50159-Discipline fisiche
CODE	15540
SCIENTIFIC SECTOR(S)	FIS/01
HEAD PROFESSOR(S)	BUSCARINO GIANPIERO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	145
COURSE ACTIVITY (Hrs)	80
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**BUSCARINO GIANPIERO** Monday 13:00 15:00 Dipartimento di Fisica e Chimica, Via Archirafi n. 36, Palermo Thursday 13:00 15:00 Dipartimento di Fisica e Chimica, Via Archirafi n. 36, Palermo

DOCENTE: Prof. GIANPIERO BUSCARINO

PREREQUISITES	The prerequisites to achieve the objectives of the course are as follows: • elementary language; logic elements; • numerical structures; operations with natural, integer, rational and real numbers; • inequalities and associated calculation rules; • elementary algebra, algebraic equations and inequalities of first and second degree; • elements of trigonometry; • real functions of real variable.
LEARNING OUTCOMES	Knowledge and understanding Knowledge of the physical laws that govern the mechanics and thermodynamics of macroscopic physical systems. Applying knowledge and understanding Ability to apply the scientific method in general; Ability to study the physical processes through proper mathematical treatment leading to quantitative solutions of the problems. Making judgments Ability to plan measures for the experimental verification of physical laws studied and evaluate the results in the light of approximations and experimental limits. Communication skills Acquisition, especially through classroom exercises and simulations of the exam, of a "scientific" language based on the fair presentation of the problem addressed, the detailed account of the procedure followed for its resolution and critical discussion of the results obtained. Learning ability Acquiring a method of study, based on a critical approach and never notionistic, of new concepts.
ASSESSMENT METHODS	Final assessment involves an oral exam that consists of an interview concerning the enunciation and the discussion of the studied physical laws and their use in solving simple problems proposed to the candidate. This exam allows one to evaluate, in addition to knowledge of the candidate and his ability to apply them, even the possession of an appropriate scientific language. Furthermore, students will be asked to prepare a report on the activities carried out in laboratory, which will be discussed during the oral examination. Finally, students will have the opportunity to take a written mid-course exam (optional) which will be considered in the overall assessment only in case of a positive outcome. The final assessment, properly graded, will be formulated on the basis of the following conditions: a) Basic knowledge of the studied physical laws and limited ability to apply themselves in new situations, sufficient capacity for analysis of the presented phenomena (18-21 rating); b) good knowledge of the studied physical laws and ability to apply them independently in situations similar to those studied, discrete analysis capabilities of the presented phenomena (22-25 rating); c) in-depth knowledge of the studied physical laws and ability to apply them to any proposed physical phenomenon, but not always readily and following a linear approach, good capacity of analysis of the presented phenomena (26-28 rating); d) deep and widespread knowledge of the studied physical laws and ability to apply them promptly and correctly to any proposed physical phenomenon, excellent analytical skills of the presented phenomena (29-30L vote).
EDUCATIONAL OBJECTIVES	The physics course, based on the knowledge acquired in the course of mathematics (trigonometry, study of functions, derivatives and elementary integrals), provides the basic information concerning the chapters of classical mechanics (kinematics, dynamics, geometry of the masses). The course aims to bring the student to the quantitative resolution of many practical problems.
TEACHING METHODS	The course is semestral and takes place in the first semester of the three-year degree course in Optics and Optometry. The teaching activity is developed through lectures and laboratory experiences. The maximum admissible limit for absences occurred during mandatory laboratory hours is 25%.
SUGGESTED BIBLIOGRAPHY	- A. Serway, J.W. Jewett, Fondamenti di Fisica, VI ed. EdiSES 2022, ISBN: 978-88-3623-073-0 - John R. Taylor, Introduzione all'analisi degli errori, Zanichelli 1999 (ISBN-10:

	8808176568, ISBN-13: 978-8808176561, ediz. 2°) Testo alternativo rispetto al primo (Serway): - D. Halliday, R. Resnick, J. Walker, Fondamenti di Fisica: Meccanica, Onde, Termodinamica, CEA 2015 (ISBN-10: 8808182983, ISBN-13: 978-8808182982, ediz. 7°).

SYLLABUS

Hrs	Frontal teaching
1	Objectives of the course and its subdivision.
3	Physical quantities. Measurement of physical quantities. Dimensional equations. Systems of Units. Scalar and vector quantities. Errors as uncertainties in the measurements. Random and systematic errors. Absolute errors and relative errors. Significant digits. Discrepancy. The estimate of errors in reading scales and in repeatable measurements.
2	Uncertainties in indirect measures. Sums and differences, products and quotients. Independent errors in a sum. Arbitrary functions of a variable. Step-by-step propagation. The general formula for error propagation. The average and standard deviation.
4	Adaptation of data to a linear relationship. Least squares method. Calculation of the constants A and B. Uncertainty in the measures of Y and meaning of the post-fit sigma. Uncertainty in the constants A and B. Adaptation to other curves by the least squares method.
7	Position. Average and instantaneous speed. Average and instantaneous acceleration. Uniform motion. Uniformly accelerated motion. Graphical representations of one-dimensional motions.
6	Vector operations: sum of two vectors. Product of a vector by a scalar. Difference between two vectors. Decomposition of vectors. Scalar product and vector.
5	Motion in multiple dimensions. Trajectory concept. Centripetal acceleration. Uniform circular motion. Angular velocity. Composition of the movements. Parabolic motion.
8	The principle of inertia. Force. Mass. Second law of motion. The fall of objects. Weight. Reaction forces. Ropes. Elastic force. Friction forces. Third law of dynamics. Falling bodies with friction. Terminal velocity. Dynamics of circular motion. Inclined plane.
2	Mass-spring system oscillations. The pendulum.
6	Work of a force. Power. Kinetic energy. Theorem of kinetic energy. Conservative and dissipative forces. Potential energy. Mechanical energy conservation theorem.
6	Momentum. Laws of dynamic for a systems of particles. Isolated systems and conservation of momentum. Center of mass. Moment of a force. Cardinal equations of statics.
6	Physical properties of fluids. Pressure. Stevin law. Buoyancy. Pascal's principle. Perfect fluids. Stationary motion of a fluid. Continuity equation. Bernoulli's theorem and its energy performance.

Hrs	Workshops
8	Description of the measuring instruments and their characteristics. Description of the experiments to be performed in the laboratory.
16	Laboratory experiences carried out by groups of students on the following topics in Classical Physics (Mechanics): Newton's three laws, conservation of momentum and collisions, inclined plane dynamics, oscillations.