UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Matematica e Informatica
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	COMPUTER SCIENCE
SUBJECT	PHYSICS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10701-Attività formative affini o integrative
CODE	08557
SCIENTIFIC SECTOR(S)	FIS/07
HEAD PROFESSOR(S)	MANTEGNA ROSARIO NUNZIO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	153
COURSE ACTIVITY (Hrs)	72
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**MANTEGNA ROSARIO NUNZIO** Tuesday 15:00 17:00 Studio del docente presso l'Edificio 18 di Viale delle Scienze previa comunicazione email all'indirizzo rosario.mantegna@unipa.it Professor's office located at Building 18 in Viale delle Scienze upon previous email agreement to rosario.mantegna@unipa.it

DOCENTE: Prof. ROSARIO NUNZIO MANTEGNA

PREREQUISITES	Mathematical concepts typically acquired in high school, including trigonometry and logarithms. Knowledge of basic concepts of claculus such as derivatives and integrals.
LEARNING OUTCOMES	Knowledge and understanding - Acquisition of the concepts and laws of classical physics. Ability to apply laws to problem solving. Applying knowledge and understanding - Ability to solve physics problems but also to extend scientific analysis to wider contexts and to apply the scientific method in solving various problems. Making judgments - A critical approach is stimulated in learning the various concepts and solving physics problems, comparing, where possible, different approaches or methodologies to a treatment, possibly discarding those that are less adequate or, where applicable, those that are inappropriate. Communication skills - Students are invited to interact during the lesson, presenting their assessment and their solution in the context addressed at the moment. Learning skills - The autonomous approach to the written text, its analysis and use is stimulated. All skills are carefully screened during the exam.
ASSESSMENT METHODS	The final exam consists of a written test and an oral test. The written test concerns the resolution, without the aid of textbooks or notes, of some problems concerning some of the main laws of classical physics. The written test allows you to verify the degree of knowledge of the physical laws being taught. In particular, the ability to analyze a physical phenomenon and its mathematical systematization is highlighted, as well as the ability to obtain quantitative results. The oral examination consists of an interview regarding the enunciation and discussion of the physical laws studied and their use in solving problems proposed to the candidate. This test allows to evaluate, in addition to the candidate's knowledge and ability to apply them, also the possession of scientific language properties and clear and direct exposure skills. The final evaluation will be obtained by averaging the evaluations of the written and oral tests, also taking into account any ongoing tests. It, suitably graduated, will be formulated on the basis of the following conditions: a) Basic knowledge of the physical laws studied and limited ability to apply them autonomously, sufficient ability to analyze the phenomena presented and to explain the procedures followed (grade 18-21); b) Good knowledge of the physical laws studied and ability to apply them autonomously to situations similar to those studied, good ability to analyze the phenomena presented and to explain the procedures followed (grade 22-25); c) In-depth knowledge of the physical laws studied and ability to apply them to any proposed physical phenomenon, albeit with some hesitation, good ability to analyze the phenomena presented and to explain the procedures followed (grade 26-28); d) In-depth and widespread knowledge of the physical laws studied and ability to apply them promptly and correctly to each proposed physical phenomenon, excellent ability to analyze the phenomena presented and excellent communication skills (grade 29-30L).
EDUCATIONAL OBJECTIVES	The course aims to introduce students to the main concepts of classical physics. In particular, the laws of motion, the principles of conservation of energy and momentum, the basic concepts of the thermodynamics of perfect gases, the electric and magnetic forces and potentials. Electric circuits with concentrated components.
TEACHING METHODS	Lectures
SUGGESTED BIBLIOGRAPHY	R. A. Serway - J.W. Jewett Jr – Fisica per scienze ed Ingegneria - Volume unico V edizione - ISBN 978-88-7959-8644 EdiSES David Halliday, Robert Resnick, Jearl Walker - Fondamenti di fisica - Settima Edizione - Casa Editrice Ambrosiana - ISBN 978-8808182296

SYLLABUS

Hrs	Frontal teaching
2	Introduction - Measurement and uncertainty - Significant digits - Dimensional analysis. Unit of measurement and international system of measurement.
2	One-dimensional motion - Reference system - Displacement - Average and instantaneous speed - Motion with constant acceleration.
2	Vectors and scalars - Vector operations - Scalar product - Vector product - Bullet motion.
2	Circular motion - Quantitative study of uniformly accelerated motions.
2	Newton's laws - Law of universal gravitation.
1	Common forces observed in mechanical systems - Tension - Elastic forces - Frictional forces.

SYLLABUS

Hrs	Frontal teaching
2	Quantitative study of systems with different types of forces.
2	Scalar product - Mechanical work - Kinetic energy.
2	Static and kinetic friction.
1	Quantitative study of mechanical work and kinetic energy.
2	Conservative and non-conservative forces - Potential energy.
2	Mechanical energy and its conservation.
1	Quantitative study on the conservation of mechanical energy.
2	Momentum - Conservation of the momentum - Collisions and momentum.
2	Elastic collisions in one dimension - Inelastic collisions - Center of mass. Newton's law for the motion of the center of mass of an extended mechanical system.
1	Quantitative study on conservation of momentum and one-dimensional collisions.
2	Harmonic motion - Oscillations - Simple pendulum.
2	Temperature and thermometers - Thermal equilibrium and zero principle of thermodynamics - Macroscopic variables of a gas and absolute temperature - Law of ideal gases.
2	Heat as energy transfer - Specific heat - Latent heat - Dilation of solids - Work done or exerted on a gas. First law of thermodynamics.
1	Quantitative study on calorimetry.
2	Microscopic description of a monatomic perfect gas - Kinetic theory - Interpretation of the temperature of a gas - Internal energy of an ideal gas.
1	Thermodynamic transformations: isotherms, isobars, and isochores.
2	Quasi-static and reversible thermodynamic transformations - PV representation - Quantitative study on isothermal, isobaric and isochore transformations.
1	Quantitative study on adiabatic transformation.
2	Heat engines - Carnot cycle - Second law of thermodynamics.
2	Quantitative study on thermal machines.
2	Irreversible transformations - Entropy - Statistical interpretation of entropy.
1	Quantitative study on the estimation of the entropy variation of a thermodynamic system.
2	Coulomb's force. Electric field. Electric field of a point charge. Gauss theorem. Field flux generated by a point-like electric charge. Field of an infinitely extended plane.
2	Conservative character of the electric forces. Electric potential energy and electric potential. Electric potential of a point charge. Work and electric potential.
2	Electric capacity. Flat condenser. Cylindrical condenser. Connection of capacitors in series and in parallel. Energy stored in a capacitor.
2	Electric current. Ohm's law. Drude model of electrical conduction. Resistivity of materials. Dissipated power and Joule effect.
2	Electric current. Ohm's law. Resistors in series and in parallel. Dissipated power and Joule effect.
2	Electromotive force, Kirchhoff's laws. Resistors in series and in parallel. Capacitor charging and discharging. RC circuits.
2	Magnetic phenomena. The magnetic field. The Lorentz force. Vectorial Product. Magnetic force on a current-carrying conductor. Moment acting on a loop crossed by a current.
2	Biot-Savart law. Magnetic force between two parallel conductors. Ampere's theorem. Field of an infinitely long wire traversed by current.
2	Field of an infinitely long wire traversed by current. Magnetic field of a toroid. Magnetic field of a solenoid.
2	Flux of the magnetic field. Faraday's Law. Induced electromotive force. Lenz's Law.
2	Inductance. Calculation of the inductance for a solenoid. RL circuit. Energy density of the magnetic field.
2	RLC series circuit, LC circuit, Resonance of a RLC series circuit. Merit factor in a resonance.