UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2019/2020
BACHELOR'S DEGREE (BSC)	CHEMISTRY
SUBJECT	PHYSICS 1
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50133-Discipline Matematiche, informatiche e fisiche
CODE	03295
SCIENTIFIC SECTOR(S)	FIS/05
HEAD PROFESSOR(S)	BARBERA MARCO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	7
INDIVIDUAL STUDY (Hrs)	111
COURSE ACTIVITY (Hrs)	64
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**BARBERA MARCO** Tuesday 15:30 17:30 Laboratorio XACT dell'INAF-OAPA in via G.F. Ingrassia 31 Thursday 15:30 17:30 Laboratorio XACT dell'INAF-OAPA in via G.F. Ingrassia 31

DOCENTE: Prof. MARCO BARBERA

PREREQUISITES	- Basic concepts of algebra, geometry, trigonometry, differential and integral calculus
LEARNING OUTCOMES	Knowledge and understanding: The student must have the full understanding of cognitive method which is the foundation of the experimental sciences and must have developed rigorous and quantitative attitude in the study of natural phenomena. The student must have understood the physical significance of the fundamental laws of classical mechanics of the material point and extended systems, Fluid, Wave Mechanics and Thermodynamics. These concepts are fundamental to understanding many of the topics that the students will face in the continuation of their scientific studies. Applying knowledge and understanding: The student must be able to apply the laws of physics, studied in the course, to solve problems describing real physical phenomena, having clear the limits of some simplifications and approximations, possibly introduced to apply the general laws to the particular case studied. The student must be able to use dimensional analysis, and a critical comparison between the value of the derived variables and expectations based on his experience of the studied phenomena, to evaluate to a first approximation if the results found are reasonably correct. Making judgments: The student must have acquired the ability to independently choose the method to solve a problem of general physics and the laws that apply to it. Communication skills: The student must have developed the ability to present in a clear, concise and rigorous way the meaning of the fundamental laws of classical physics. In addition, the student should be able to solve, in written form, problems and exercises and to present in a comprehensible manner the methodology chosen to answer the questions, the calculations made and the results obtained. Learning skills: The student must acquire skills to organize efficiently the time he dedicates to study in order to keep up with the teaching program carried out in the classroom, thus having gradually the tools and knowledge necessary for understanding the topics subsequently introduced. The student must maintain a fair balance between the aim of achieving the basic knowledge of the topics in the course program, and the desire to deepen some topics.
ASSESSMENT METHODS	The final evaluation is based on the results of a written test and an oral exam. Students that during the year have passed all tests in progress can directly face the oral test, only for the first two exam sessions available (summer and fall) of the year in which they have taken the course. The vote expressed in thirtieths is appropriately sized based on the following conditions: a) Basic knowledge of the laws of classical physics object of the course program, sufficient knowledge and ability to apply them to problem solving (18-22); b) Good knowledge of the laws of classical physics object of the course program, fair degree of awareness and ability to apply them to problem solving (22-26); c) Good knowledge of the laws of classical physics object of the course program, good degree of awareness and ability to apply them to the solution of problems, insight and ability to answer to difficult questions (27-30 cum laude);
EDUCATIONAL OBJECTIVES	Students should become familiar with the scientific method of investigation and be able to apply it in the understanding and modeling of the physical reality. They have to acquire the necessary basic knowledge of the laws of Classical Mechanics of material point and extended systems, Fluid, Wave mechanics and classical thermodynamics. Particular attention will be paid to the study of the laws of conservation of physical quantities, and where possible in the interpretation of physical phenomena studied by both the macroscopic and microscopic point of view.
TEACHING METHODS	The course takes place in the second semester of the first year of the Bachelor degree in Chemistry. The teaching activity consists of lectures (5 credits) and tutorial excercises (2 credits). Attendance at lectures is mandatory. During the semester one or two in progress written tests are carried out.
SUGGESTED BIBLIOGRAPHY	1. J. Walker, D. Halliday, R. Resnick, "Fondamenti di Fisica", Casa Editrice Ambrosiana 2. R.A. Serway, J. W. Jewett Jr, “Principi di Fisica”, EDISES

SYLLABUS

Hrs	Frontal teaching
2	Introduction • The scientific method; Physics in the context of experimental science; • Physical quantities and the International System of Units; • Measurement of physical quantities and uncertainties; • Scalars and vectors; vector's sum and components.
2	Some ideas of modern physics
3	Kinematics • Position, displacement, velocity, acceleration; • Motion in one dimension: uniform motion, uniformly accelerated motion; • Motion in two dimensions: projectile motion.
3	Dynamics of a particle • The force; • The first Newton's law and inertial systems; • The second and third Newton's law, the frictional force; • Uniform circular motion, acceleration and centripetal force.
3	Work and Energy • Work done by a constant force, the scalar product of vectors; • Work done by a variable force, elastic force of a spring; • Kinetic Energy theorem and kinetic energy; • Conservative and non-conservative forces, potential energy; • Conservation of mechanical energy; • Conservation of energy; • Power.
2	Dynamics of multi-body systems • The center of mass, Newton's second law for a system of particles; • Linear momentum; • Conservation of linear momentum; • Collisions.
4	Rotational motion • The rotational variables; • Rotational kinetic energy, rotational inertia; • Torque, Newton's second law for rotation; • The vector product; • Angular momentum and its conservation.
1	Equilibrium and Elasticity
2	Gravitation • Newton's law of gravitation; • Gravitation near the Earth's surface; • Gravitational potential energy; • Kepler's laws; • Satellites: orbits and Energy.
2	Fluids at rest • Density, pressure; • Stevino's law; • Pascal's principle; • Archimedes' principle.
2	Fluid Dynamics • Ideal fluids, equation of continuity, Bernoulli's equation; • Viscosity, Poiseuille's Law. Surface tension and capillarity
2	Oscillations • Simple harmonic motion, the pendulum; • Forced Oscillatotions and resonance; • Damped oscillations.
2	Transverse mechanical waves • Wave Speed on a Stretched String; • Energy and Power of a Wave Traveling Along a String; • Superposition of waves: interference, standing waves, resonance.
2	Acoustic waves • The speed of sound; • Intensity and sound level; • interference of sound waves, beats; • The Doppler effect.2
3	Temperature and heat • Thermodynamic systems,. thermal equilibrium. temperature, heat; • Thermal expansion, heat capacity and specific heat; • Heat transfer: conduction, convection and radiation; • The first law of Thermodynamics.

SYLLABUS

Hrs	Frontal teaching
2	Kinetic theory of gases • Avogadro's number; • Equation of state of an ideal gas, work done by an ideal gas; • temperature and mean translational kinetic energy; • mean free path, distribution of molecular velocities; • Degrees of freedom and the molar specific heat.
3	The second law of Thermodynamics • Reversible and irreversible processes; • Entropy and the second Law of Thermodynamics; • Heat engines, the Carnot cycle, thermal efficiency; • Entropy and statistics.

Hrs	Practice
24	Exercises and questions to clarify and deepen the theoretical arguments. The activity is distributed during the academic semester. 1 hour - Physical quantities and measure units 1 hour - Vector algebra 2 hours - One-dimensional motion, graphs of position, speed, acceleration 2 hours - Material point kinematics 4 hours - Dynamics of translational motion, application of Newton's laws 2 hours - Work, Energy, the kinetic energy theorem 2 hours - Conservative forces, conservation of mechanical energy 2 hours - Collisions and conservation of linear momentum 1 hour - Balance, Elasticity, Gravitation 2 hours - Oscillations and mechanical waves 1 hour - Fluids 2 hours - Temperature scales, thermal expansion, equation of state of an ideal gas,, kinetic theory of gases 2 hours - Thermodynamic processes