UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	MANAGEMENT ENGINEERING
SUBJECT	CHEMISTRY
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50293-Fisica e chimica
CODE	01788
SCIENTIFIC SECTOR(S)	CHIM/07
HEAD PROFESSOR(S)	ALESSI SABINA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**ALESSI SABINA** Monday 15:00 16:30 su TEAMS:https://teams.microsoft.com/l/team/19%3AvmYkmcJYPgz-eZxOD12AgTTKk3UKu2ay6wUcWe9lm1c1%40thread.tacv2/conversations?groupId=dbae24b6-02c7-4914-a311-b3f1db3907f7&tenantId=bf17c3fc-3ccd-4f1e-8546-88fa851ba Thursday 12:15 13:30 Ed. 6 Ing. Chimica piano III stanza 3010

DOCENTE: Prof.ssa SABINA ALESSI

PREREQUISITES	Elementary basic knowledge of mathematics and physics.
LEARNING OUTCOMES	Knowledge and understanding: knowledge of the fundamental of the electronic material structure and of physical/chemical transformation. Applying knowledge and understanding: ability to use the fundamentals of material structure for qualitative structure/properties relationships. Moreover, on the base of simple thermodynamic considerations, ability to choose the best reaction processing conditions. Making judgments: The student will be able to evaluate: - The validity and the approximation of the models relative to the material physical and chemical behaviour; - The use of the fundamental principles of the thermodynamics and of the kinetics in order to carry out the chemical reactions Communication skills: ability to discuss the chemical topics presented during the course with particular reference to both atomic and molecular structure and also to both chemical reactions thermodynamics and kinetics fundamentals, using an appropriate scientific terminology. Learning ability: At the end of the course the student will know the fundamental principles of the material structure and of the thermodynamic and kinetic aspects of chemical reactions. He will understand the difference between a phenomenological approach and a microscopic/ modellistic approach in the study of the material properties, and of its transformation. All these skills will contribute to the formation of the scientific student background in view of the further engineering studies.
ASSESSMENT METHODS	Written exam and optional oral exam if the student request it or if the professor requires it in order to clarify some aspects of the written exam. Written exam consists in a number of exercises varying between 6 and 10, depending on the difficulties of each of them and it has a duration of 90 minutes at least; it is mandatory to carry out some exercises, properly indicated in the assignment. Some of them are prevalently numeric exercises, other are prevalently theoretical exercises. The overall evaluation of the written test depends in turn on the single evaluation of each question that can be correct, incorrect or not complete for the numeric exercises. As for the theoretical exercises, they could be both open both semi- structured and specifically designed to test the results of learning provided for, will tend to verify: a) the knowledge captured; b) the processing capacity, c) the achievement of an adequate skill to establish correlations among the course arguments. The evaluation is expressed in thirtieths. The final evaluation will be: Excellent (30-30 and praise). Very good knowledge of the topics with analytical ability, excellent properties of language, the student has an excellent ability to apply knowledge to solve problems proposed Very Good (26-29). Good command of the topics, full of language, the student is able to apply knowledge to solve problems proposed. Good (24-25). Basic understanding of the main topics, discrete properties of language, with limited ability to independently apply the knowledge to the solution of the proposed problems. Satisfactory (21-23).The student has not fully mastered the main teaching subjects but it has the knowledge, satisfactory property language, poor ability to independently apply the knowledge acquired. Sufficient (18-20). Minimum basic understanding of the major teaching and technical language issues, very little or no ability to independently apply the knowledge acquired. Insufficient. The student does not have an acceptable knowledge of the contents of the topics covered in the teaching.
EDUCATIONAL OBJECTIVES	The knowledge of the fundamentals aspects of the material structure and its transformations, with particular reference of the thermodynamic and kinetic behavior of ideal systems.
TEACHING METHODS	Teaching takes place in the second half of the first year and consists of lectures and of numerical exercises.
SUGGESTED BIBLIOGRAPHY	- R.Bertani, M.Dettin, M.Mozzon, P.Sgarbossa "Fondamenti di Chimica per le Tecnologie" - Ed. EdiSES - A. Del Zotto - Esercizi di Chimica Generale- EdiSES

SYLLABUS

Hrs	Frontal teaching
3	Chemical elements, compounds and mixtures. Atoms, molecules, ions, Mole, Chemical reactions and stoichiometric calculations
1	Thermodynamic system, state functions and equations. Homogeneous and heterogeneous systems, phase. Homogeneous systems concentrations units: molarity, molality, molar fraction, weight and volume percentage
3	Gaseous systems. Ideal gas: state equation. Kinetic theory of ideal gases; molecular velocities distribution. Real gases: Van der Waals equation
1	First law of thermodynamics and thermochemistry: internal energy and enthalpy. Exothermic and endothermic transformations
4	Second law of thermodynamics and chemical equilibrium. Entropy, free enthalpy, free energy. Standard conditions. Equilibrium constant for homogeneous reactions. Le Chatelier-Braun principle. Equilibrium constant for etherogeneous reactions
2	Liquid-vapor equilibrium: vapor pressure of a liquid. Liquid boiling point. Solid-liquid and solid-vapor equilibria.

SYLLABUS

Hrs	Frontal teaching
7	Bohr atomic model for hydrogen atom. Schrodinger equation. Atomic orbitals for hydrogen atom and for polyelectronic atoms. Electronic configuration of the elements and periodic table of the elements Periodic properties: ionization energy and electronic affinity
5	Chemical bond. Ionic bond. Covalent bond: valence bond theory. and bonds. Polar covalent bonds: electronegativity. Dative bond. Molecular geometry and hybrid orbitals. Van der Waals forces. Hydrogen bond. Metallic bond.
6	Acid-base equilibrium. Molecular structure/acid base properties relationships. Solubility equilibrium. Colligative properties of the solutions
6	Redox reactions and electrochemistry. Oxidation number. Conjugated redox pair. Piles and galvanic semielements: redox standard potentials. Nernst equation. Electrolysis. Faraday's laws 3
1	Hints of chemical kinetics. Homogeneous reactions. Reactions rate, reaction order. Influence of the temperature on the reaction rate: Arrhenius equation. Catalysts

Hrs	Practice
3	Chemical elements, compounds and mixtures. Atoms, molecules, ions, Mole, Chemical reactions and stoichiometric calculations
2	Homogeneous systems concentrations units: molarity, molality, molar fraction, weight and volume percentage
2	Gaseous systems. Ideal gas: state equation.
2	Second law of thermodynamics and chemical equilibrium. Entropy, free enthalpy, free energy. Standard conditions. Equilibrium constant for homogeneous reactions. Le Chatelier-Braun principle. Equililbrium constant for etherogeneous reactions
3	Solution equilibria. Solubility and saturated solutions. Solubility of gases in liquids: Henry's law. Acid-base equilibrium. Molecular structure/acid base properties relationships. Solubility equilibrium. Colligative properties of the solutions
3	Redox reactions and electrochemistry. Oxidation number. Conjugated redox pair. Piles and galvanic semielements: redox standard potentials. Nernst equation. Electrolysis. Faraday's laws