UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche		
ACADEMIC YEAR	2019/2020		
BACHELOR'S DEGREE (BSC)	CHEMISTRY		
INTEGRATED COURSE	PHYSICAL CHEMISTRY II WITH LABORATORY		
CODE	19747		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	CHIM/02		
HEAD PROFESSOR(S)	MILIOTO STEFANA	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)	BONASERA AURELIO	Ricercatore a tempo determinato	Univ. di PALERMO
	MILIOTO STEFANA	Professore Ordinario	Univ. di PALERMO
CREDITS	9		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	3		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**MILIOTO STEFANA**		
	Monday 14:30 15:30	Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze	
	Wednesday 14:30 15:30	Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze	
	Friday 14:30 15:30	Stanza 0/C9 - Dipartimento di Fisica e Chimica - Ed. 17 - Viale delle Scienze	

DOCENTE: Prof.ssa STEFANA MILIOTO

PREREQUISITES	The required prerequisites to guarantee that the course is profitable for the students deal with the knowledge of topics learnt into the course of Physical Chemistry I and, specifically, the topics are classical thermodynamics and ideal solutions.
LEARNING OUTCOMES	KNOWLEDGE AND CAPACITY OF COMPREHENSION The student has to know the fundamentals of physical chemistry applied to simple and complex solutions and to the interphases with a particular attention to the behavior of non-ideal solutions through the study of thermodynamic functions, interfacial and rheological properties. On the basis of the acquired knowledge, the student will improve his skill on the scientific method of investigation and he will be able to understand the relationships between the molecular and the macroscopic properties of the real systems CAPACITY TO APPLY KNOWLEDGE AND COMPREHENSION The student has to be able to apply concepts, techniques and physico-chemical methodologies to recognize the microscopic interactions by interpreting and predicting the macroscopic behavior of real and interfacial systems . JUDGEMENT The student has to possess skills in interpreting and evaluating data related to the physico-chemical properties of non-ideal and interfacial systems demonstrating capacity of independent judgment in assessing and quantifying the experimental results. ABILITIES FOR COMMUNICATION The student has to be able to describe in a clear and rigorous manner the acquired topics as part of activities and professional relationships. Assessment of the achievement of such a capacity takes place through the oral examination where the ability, fairness and rigor in the exposition are also evaluated. LEARNING CAPACITY The student has to be able to update and to adapt, in an independent way, the physico-chemical approaches acquired during the course to higher level of knowledge.
ASSESSMENT METHODS	The student evaluation is done through a colloquium where two questions are asked: one deals with the topic of thermodynamics of non-ideal solutions and interphases and/or the rheological properties while the second one deals with the phase diagrams. The candidate who may make exercise on the self-check of his acquired competence and expertise chooses the topic of the first question. Moreover, the student discusses one of the experiment. The colloquium will ascertain the competences possession and knowledge of the course disciplines as well as the skill of the scientific language and the exposure abilities. The final evaluation predicts different classes as described in the following: 1) Basic knowledge of course topics and limited capacity of knowledge processing and of correlation among the various topics. Sufficient capacity analysis of the proposed phenomena. Reduced ability of judgement and of exposure of the pursued procedures (rating 18-21) 2) Good knowledge of course topics and good capacity of knowledge processing and of correlation among the various topics. Good capacity of analysis of the proposed phenomena. Good ability of judgement and of exposure of the pursued procedures (rating 22-24) 3) Very good knowledge of course topics and rather good ability of knowledge processing and of correlation among the various topics. Really good capacity of analysis of the proposed phenomena. Really good ability of judgement and of exposure of the pursued procedures (rating 25-27) 4) Excellent knowledge of the topics, excellent and prompt capacity of knowledge processing and of correlation among the various topics by applying the acquired knowledge even to contests different from those proper of the course. Very good capacity of analysis of the proposed phenomena. Very good judgement and exposure ability of the pursued procedure (rating 28-30) 5) Excellent knowledge of the topics, excellent and very smart capacity of processing knowledge and of correlation among the various topics by applying the acquired knowledge even to contests different from those proper of the course. Excellent capacity of analysis of the proposed phenomena. Excellent judgement ability and of exposure of the pursued procedure (rating 30 cum laude)
TEACHING METHODS	The course is given through lectures (Module of Physical Chemistry II) and experiments performed in laboratory (Module of Laboratory of Physical Chemistry II)

MODULE
PHYSICAL CHEMISTRY II - LABORATORY

Prof. AURELIO BONASERA

SUGGESTED BIBLIOGRAPHY

Trattato di Chimica Fisica, S. Glasstone, I Edizione Italiana, Manfredi Editore (1963).
Principles of Colloid and Surface Chemistry, P. C. Hiemenz, III Edizione, Marcel Dekker (1997).
Chemical Thermodynamics, Basic Concepts and Methods, I. M Klotz and R. M. Rosenberg, VII Edizione, Whiley Ed. (2008)

AMBIT	10693-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	30
COURSE ACTIVITY (Hrs)	45

EDUCATIONAL OBJECTIVES OF THE MODULE

The module aims to apply in the laboratory the concepts acquired in the physical chemistry I and physical chemistry II courses. Each student will carry out three experiments that essentially embrace all the subjects of the above courses. The proposed approach is based on problem-solving. The results of the experiences will be discussed through a circular didactic approach.

SYLLABUS

Hrs	Workshops
15	Determination of the apparent molar volume of a solute in solution. Performing the experiment, the data analysis involving the application of errors theory and elaboration of a report.Discussion of results
15	Determination of a ternary phase diagram: performing the experiment, the data analysis involving the application of errors theory and elaboration of a report. Discussion of results.
15	Solute surface excess determination: performing the experiment, the data analysis involving the application of errors theory and elaboration of a report. Discussion of results.

MODULE
PHYSICAL CHEMISTRY II

Prof.ssa STEFANA MILIOTO

SUGGESTED BIBLIOGRAPHY

I Principi dell'Equilibrio Chimico, K. G. Denbigh, II Edizione, Casa Editrice Ambrosiana (1971).
Chemical Thermodynamics, Basic Concepts and Methods, I. M Klotz and R. M. Rosenberg, VII Edizione, Whiley Ed. (2008)
Trattato di Chimica Fisica, S. Glasstone, I Edizione Italiana, Manfredi Editore (1963).
Principles of Colloid and Surface Chemistry, P. C. Hiemenz, III Edizione, Marcel Dekker (1997).
Surfactants in Solutions. New methods of investigation, R. Zana, Marcel Dekker (1986).

AMBIT	50135-Discipline chimiche inorganiche e chimico-fisiche
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48

EDUCATIONAL OBJECTIVES OF THE MODULE

The course aim is providing knowledge on the physico-chemical behavior (from the thermodynamic, phase and rheological view-points) of non-ideal systems to the student who can acquire skills on the recognition of microscopic interactions from the macroscopic properties. Such a knowledge combined with the experience acquired during the laboratory activities will allow the student to perform fundamental operations in a Chemistry Laboratory.

SYLLABUS

Hrs	Frontal teaching
2	Aims of the course. Elements of thermodynamics of ideal solutions
3	Solvent and solute activity
3	Experimental measurements of activity coefficients
2	Dependence of the activity coefficient on temperature and pressure
5	Apparent and partial molar properties (volume, enthalpy, heat capacity) and their experimental determination.
3	Gibbs free energy, volume, enthalpy, entropy and heat capacity: standard states for solute and solvent
3	Strong electrolytes. Thermodynamic properties of ions in solution.
3	Thermodynamics of nanostrucured systems
2	Phase diagrams of liquid systems. Binary mixtures of partially miscible liquids: temperature vs composition diagram and its thermodynamic prediction.
2	Phase diagrams of ternary systems. Grafic representation. Mixtures composed of : 1) two pairs of partially miscible liquids; 1) three pairs of partially miscible liquids.
2	Teas solubility diagrams: solubility parameters of polar and apolar solvents.
3	Interfacial properties. The importance of interfacial area. Surface tension: a thermodynamic definition. Experimental methods for measuring surface tension
4	Binary mixtures: isotherm of Gibbs adsorption. Thermodynamic approach to Place equation. Kelvin equation for vapor tension.
2	Wettability and contact angle. Spreading coefficient.
3	Rheological properties. Newtonian liquids. Poiseuille equation. Expertimental methods for measuring viscosity coefficient.
3	Huggins equation. Viscosity of molecules and macromolecules solutions.
1	Hydrodynamic radius of particles from viscosity measurements.
2	Case studies. Application of Physical Chemistry to the Environment and Cultural Heritage