UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2020/2021
MASTER'S DEGREE (MSC)	BIOTECHNOLOGIES FOR INDUSTRIES AND SCIENTIFIC RESEARCH
SUBJECT	APPLIED PHYSICAL CHEMISTRY
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20883-Attività formative affini o integrative
CODE	01883
SCIENTIFIC SECTOR(S)	CHIM/02
HEAD PROFESSOR(S)	LOMBARDO RENATO Ricercatore Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**LOMBARDO RENATO** Tuesday 10:00 12:00 Dipartimento STEBICEFStudio 1/B4, edificio 17, viale delle Scienze Thursday 10:00 12:00 Dipartimento STEBICEFStudio 1/B4, edificio 17, viale delle Scienze

DOCENTE: Prof. RENATO LOMBARDO

PREREQUISITES	Mathematics: concepts needed for this course are those provided in any introductory course at the undergraduate level. In particular: exponents and scientific notation, logarithms, differential differential calculus, integral calculus. Physics: concepts needed for this course are those provided in any introductory course at the undergraduate level. In particular: unit of measurements and measurement systems, extensive and intensive properties, forces, force fields, work and energy. Chemistry: concepts needed for this course are those provided in any introductory course at the undergraduate level. In particular: atomic and molecular structure of matter, method to express quantity of matter and concentration, chemical reactivity.
LEARNING OUTCOMES	Interpreting the macroscopic scale phenomena based on the dispersion, interaction and reaction on the atomic and molecular scale. Capacity to analyze the phenomena in terms of transformation, transfer and distribution of energy, and analysis of their direction based on entropy / free energy. Capacity to apply thermodynamic principles to chemical and biochemical systems in transformation with particular regard to phase and chemical equilibrium in the biological field. Knowledge of the principles that regulate the rate of the chemical transformations with emphasis on enzyme catalysis and protein folding.
ASSESSMENT METHODS	Up to four midterm tests. Each test consists of a set questions aimed at ascertaining the possession of the knowledge concerning the program carried out up to that point. In particular, the knowledge of the function discussed and their relationships using the models of the discipline and the experimental methods. The assessment is expressed in thirtieths giving a positive score to each correct answer and a negative one to each wrong answer. The scores will be appropriately balanced taking into account the difficulty of each question. The positive outcome of the tests will be taken into account in the formation of the final result after the oral exam (see below). Single oral exam. The exam consists of an interview in which the questions will be used to ensure that the student acquired the skills and knowledge provided by the course. In particular, will be 'evaluated the ability to relate the different concepts, to provide solutions to typical problems of the subject and the ability to express themselves effectively in scientific language of this field. The assessment is expressed in thirtieths. The maximum score (30/30) will be achieved when the candidate will be able to master fully and independently all these aspects in an efficient and effective way. To achieve the minimum score (18/30) he/she will demonstrate sufficient understanding of models and concepts expressed in the course and the ability to solve simple problems in a sufficiently autonomous way.
EDUCATIONAL OBJECTIVES	To provide the cultural tools to connect the atomic-molecular vision with that at the macroscopic level and to interpret biomolecular phenomena in terms of energy by means of thermodynamic principles. To Illustrate examples of application of the typical tools of physical chemistry to issues of interest for biotechnology.
TEACHING METHODS	Class lectures
SUGGESTED BIBLIOGRAPHY	Testi di base: Atkins, P.W.; De Paula, Elementi di Chimica Fisica, Zanichelli, 2018 Atkins, P.W.; De Paula, J. Elements of Physical Chemistry, Oxford University Press, 2017 Atkins, P.W.; De Paula, J.; Keeler J. Chimica Fisica, Zanichelli, 2020 Testi di approfondimento: Kuriyan, J.; Konforti, B.; Wemmer, D. The Molecules of Life: Physical and Chemical Principles; Garland Science: New York, 2004. Cooper, A. Biophysical Chemistry, 2 edizione.; Royal Society of Chemistry: Cambridge, 2011. Sheehan, D. Physical Biochemistry: Principles And Applications, 2 edizione.; John Wiley & Sons Inc Print on: Chichester, UK ; Hoboken, NJ, 2009.

SYLLABUS

Hrs	Frontal teaching
6	Matter at the atomic scale and the intermolecular interactions: phenomena and applications
5	Molecular Dynamics
4	Energy and Thermodynamics
6	The direction of transofrmations
4	Gibbs' energy
4	Multiple components systems and phase transitions

SYLLABUS

Hrs	Frontal teaching
4	Chemical equilibrium
4	Applications of thermodynamic to biological systems
4	Rate and mechanism of chemical reactions
7	Applications of kinetics to biological systems