UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2021/2022
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	The ongoing assessment will be conducted through tests (up to four) and / or activities on the university's e-learning platform. Each test consists of a set of questions aimed at ascertaining the possession of the knowledge inherent to the program carried out up to that point. In particular, the knowledge of the discussed quantities and their relationships through the models of the discipline, of the experimental methods, is really evaluated. The evaluation will be expressed out of thirty by assigning a positive score to each correct answer and a negative score to each incorrect answer. The scores will be appropriately balanced taking into account the difficulty of each question. Activities on the e-learning platform can be single or group activities and may involve producing short written papers or presentations, solving quizzes or other activities. 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. Possible results are: Excellent: 30 - 30 cum laude Outcome: Excellent knowledge of the topics, language, and skills in the use of tools. Good competence in applying what has been acquired to new problems. Good: 27 - 29 Outcome: Good knowledge of the topics, language, and skills in the use of tools. Fair competence in applying what has been acquired to new problems. Fair: 24 - 26 Outcome: Fair knowledge of the topics, language, and skills in the use of tools. Sufficient competence in applying what has been acquired to new problems. Sufficient: 18 - 23 Outcome: Sufficient knowledge of the topics, language, and skills in the use of tools. Minimum competence in applying what has been acquired to new problems.
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, ISBN 9788808220684 Atkins, P.W.; De Paula, J. Elements of Physical Chemistry, Oxford University Press, 2017, ISBN 9780198727873 Atkins, P.W.; De Paula, J.; Keeler J. Chimica Fisica, Zanichelli, 2020, ISBN 9788808620521 Testi di approfondimento: Kuriyan, J.; Konforti, B.; Wemmer, D. The Molecules of Life: Physical and Chemical Principles; Garland Science: New York, 2004. ISBN 978-0-8153-4188-8 Cooper, A. Biophysical Chemistry, 2 edizione.; Royal Society of Chemistry: Cambridge, 2011. ISBN 978-1-84973-081-5

	Sheehan, D. Physical Biochemistry: Principles And Applications, 2 edizione.; John Wiley & Sons Inc Print on: Chichester, UK ; Hoboken, NJ, 2009., ISBN 978-0-470-85603-1

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