Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	General and Inorganic Chemistry
Course code	42102
Scientific sector	CHIM/03
Degree	Bachelor in Industrial and Mechanical Engineering and Agricultural and Agro-Environmental Sciences
Semester	I
Year	I
Academic year	2017-2018
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	---
Total exercise hours	64
Attendance	
Prerequisites	None
Course page	

Specific educational objectives	The course is part of the courses in the area of basic sciences and specifically in the context of chemical sciences. The aim of the course is to provide students with an adequate command of general scientific principles and methods as well as the acquisition of specific professional knowledge The purpose of the course is to provide the basic knowledge on the structure of matter as well as the thermodynamic and kinetic principles that regulate its transformation. Special attention will be given to the chemical reactions occurring in the agro-environmental biosphere through the study of the structural and functional properties of simple molecules in the bio-geo-chemical cycles of the elements. In addition, the knowledge acquired in this course will be useful to understand topics such as material technology, experimental physics and energetic systems.

Lecturer	Stefano Ciurli, Room C4.02, Stefano.Ciurli@unibz.it
Scientific sector of the lecturer	CHIM/03
Teaching language	English
Office hours	During the semester
Teaching assistant (if any)	Dott. Luca Mazzei
Office hours	
List of topics covered	Atomic structure, energy, electromagnetic radiation,

	wave-particle dualism, quanta and photons, uncertainty principle, wave functions, energy levels, atomic models, quantum numbers, Bohr model of the hydrogen atom, electronic structure of multi-electron atoms, electronic configuration, periodic table and periodic properties. The nature of the chemical bond, valence bond theory, covalent bond, Lewis formalism, bonding and non-bonding electron pairs, resonance, formal charge, bond order, octet rule, radicals, molecular electric dipole, polar covalent bond, electronegativity, bond length and bond energy, polarizability, molecular structure, VSEPR model, hybridization of atomic orbitals. Ionic bond and crystal lattices. Intermolecular forces and their electrostatic nature, properties of solids and liquids, hydrogen bond and the structure of water. Properties of ideal and real gases. Thermochemistry, thermodynamic system, thermodynamic state, internal energy, work, heat, thermal capacity, temperature, reaction enthalpy, entropy, Gibbs free energy. The chemical equilibrium, equilibrium constant, state diagrams, solubility, colligative properties. Gas phase equilibria, Le Chatelier principle. Aqueous phase equilibria. Acids and bases, self-protolysis of water, acid/base conjugate pairs, pH, pOH, acidity scale, weak and strong acids and bases, solution pH, polyprotic acids, buffers, acid/base titrations. Heterogeneous equilibria and solubility. Redox reactions, galvanic cells, cell potential, Nernst equation. Chemical kinetics, reaction rate, kinetic law, order of reactions, activation energy, Arrhenius law, catalysis.
Teaching format	The lectures will involve the use of presentations through a beamer driven by a PC. Multimedial material will be presented, such as slides, movies, animations and three-dimensional visualization of atoms, molecules and materials. Problem solving sessions will be carried out in order for the student to gain acquaintance with the numeric treatment of chemical problems. Laboratory sessions are integral part of the course

Learning outcomes	Knowledge and understanding of the chemical transformations of matter. Ability to apply knowledge and understanding through the development of practical skills laboratory and the ability to draw information from the laboratory activities to support / information integration theory lessons. Making judgments through the choice of analytical protocols, preparation of a report. Communication skills to present the acquired skills with their own lexicon and relevant to the discipline. Lifelong learning skills through the possession of tools for acquiring information. The purpose of the course is to provide the basic

	knowledge on the structure of matter as well as the thermodynamic and kinetic principles that regulate its transformation. Special attention will be given to the chemical reactions occurring in the agro-environmental biosphere through the study of the structural and functional properties of simple molecules in the bio-geo-chemical cycles of the elements. In addition, the knowledge acquired in this course will be useful to understand topics such as material technology, experimental physics and energetic systems.

Assessment	Assessment is conducted via a written and oral test that includes questions to assess the knowledge and understanding of the course topics and questions designed to assess the ability to transfer these skills to more specific cases. Time will also be dedicated to the evaluation of the ability to reprocess the laboratory experience.
Assessment language	English
Evaluation criteria and criteria for awarding marks	Attribution of a single final grade. Criteria for the allocation of voting: the clarity of the response is evaluated and the properties of language (including in relation to the language of the course), the ability to synthesize, the relevance of arguments and the relevance of the topics covered, the independence of judgment, the ability to rework.

Required readings	Atkins, Jones "PRINCIPI DI CHIMICA", Casa Editrice Zanichelli, Bologna, English Edition
Supplementary readings	None