Principles of General and Inorganic Chemistry [209]

COURSE OUTLINE

(1) GENERAL

SCHOOL	ANIMAL BIOSCIENCES		
ACADEMIC UNIT	DEPARTMENT OF ANIMAL SCIENCE		
LEVEL OF STUDIES	Undergraduate [Required]		
COURSE CODE	209	**SEMESTER**	1st
COURSE TITLE	PRINCIPLES OF GENERAL & INORGANIC CHEMISTRY		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Course: Theory and Laboratory Practice (3+2)	5	5

COURSE TYPE	Foundation course
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	No
COURSE WEBSITE (URL):	https://mediasrv.aua.gr/eclass/courses/EZPY146/
TEACHING STAFF:	THEORY: S. Haroutounian, S. Koulocheri LABORATORY: S. Koulocheri, S. Haroutounian, E. Zoidis

(2) LEARNING OUTCOMES

Learning outcomes

Introduction to basic concepts and principles of General and Inorganic Chemistry with special focus on the structures and properties of chemical elements and molecules found in life sciences and agriculture.
Final goal is to facilitate the students to comprehend efficiently related chapters of biochemistry, pharmacology, environmental chemistry, etc.
Upon successful completion of the course, students will be able (according to Bloom) to:

- Know and understand the chemical elements and their electronic structures (**Knowledge / Understanding**).
- Understand the organization of the periodic table and the periodic properties of elements (**Understanding**).
- Recognize the classes of chemical bonds, theories of valence-bonding, hybridization, and molecular orbitals (**Knowledge / Understanding**).
- Understand intermolecular forces, including hydrogen bonding (**Understanding**).
- Comprehend the liquid, gaseous, and solid states of molecules (**Understanding**).
- Understand solution theories and their applications in analytical chemistry (**Understanding / Application**).
- Understand chemical equilibria, including acid-base and salt equilibria (**Understanding**).
- Comprehend ionic equilibria, hydrolysis, buffer systems, and colloids (**Understanding / Analysis**).
- Understand the concepts of oxidation-reduction, redox reactions, and galvanic cells (**Understanding / Application**).
- Know the nomenclature, theories, stability, and bonding of coordination complexes (**Knowledge / Understanding**).
- Calculate bond orders and predict the geometry of simple molecules (**Application / Analysis**).
- Predict hybridization, molecular structure, magnetic properties, and colors of coordination complexes (**Analysis / Evaluation**).
- Safely and efficiently handle laboratory equipment (**Application / Skill**).
- Apply theoretical knowledge in the laboratory to solve chemical problems and analyze experimental data (**Application / Analysis / Evaluation**).

General Competences

- Data analysis-synthesis, information mining. Application of relevant technologies
- Adapting new situations
- Teamwork (in the lab)
- Working in a multidisciplinary environment

- Respect the natural environment
- Exercise criticism and self-criticism
- Promotion of creative and inductive thinking

(3) SYLLABUS

THEORY

• Structure of atoms (hydrogen atom, quantum numbers, magnetic properties)
• Electronic structure and properties of atoms (periodic table, size, ionization energy, electronic affinity, electronegativity, oxidation number and elements' classification)
• Ionic bond, covalent bond, molecules' geometry-VSEPR theory, bond length and energy
• Valence bond theory and orbital hybridization
• Molecular Orbital (MO) theory, application on diatomic homonuclear and heteronuclear molecules and simple polyatomic molecules consisting of elements of 1st and 2nd period. Calculation of their bond order and geometry.
• Chemistry of solutions (characteristics, hydration, temperature and pressure effect on solubility, concentration, vapors pressure, boiling and freezing points). Distillation, osmosisosmotic pressure, electrolytes, colloids.
• Chemical equilibrium (description, equilibrium constants, reversible reactions, Le Chatelier's principle)
• Acids and Bases (Acids-Bases according to Arrhenius, Bronsted-Lowry and Lewis theories, strength of acids and bases)
• Ionic equilibrium (ionization of weak monoprotic acids-bases, ionization of water, pH, pHindicators, effect of common ions, buffer solutions, ionization of polyprotic acids, titration of acid, solubility and precipitation)
• Oxidation-reduction (oxidation number, oxidation reactions, galvanic cells)
• Coordination compounds (definition, nomenclature, isomers, stability of coordination compounds, Valence Bond and Crystal Field theories, hybridization-geometry, magnetic properties, color, applications and biological significance of coordination compounds)

LABORATORY

• Laboratory safety rules
• Laboratory Equipment
• Data Processing / Results Processing
• Laboratory techniques-procedures (Weighing – Volume measurement)
• Observation of Chemical Reactions (Group 1 Cations)
• Preparation of solutions Part I.
• Preparation of solutions Part II
• Preparation of solutions Part III
• pH measurement
• Acid - Base titration (Oxymetry)
• Preparation of a buffer solution
• Complexometric titration: Determination of water hardness

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In class (theory-laboratory) and remote support via e-mail
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Power point presentations and video projections in lectures Use of e-class platform Students' support via e-mail
TEACHING METHODS	

Activity	***Semester workload***
Lectures	39
Laboratory practices	26
Individual assignment	45
Teamwork	15
Course total (25 h of workload per ECTS)	***125***

STUDENT PERFORMANCE EVALUATION	Theory Optional attendance of the Lectures by the students. Written exams (100%) (either as final exam or as the sum of two progress exams during the semester) Laboratory "Mandatory attendance of laboratory exercises by the students with attendance recording. Written exam (Multiple choice questions, simple questions and problems) 70% Individual work assignment 15 % Laboratory-experimental exam 15%

	or Written exams (100%) III. The language of assessment is Greek. IV. The assessment criteria are communicated to the students.

(5) ATTACHED BIBLIOGRAPHY

• All lectures are available at e-class as power-point presentations Books:
• «Basic principles of Inorganic Chemistry» (Greek), G. Pnevmatikakis, Ch. Mitsopoulou and K. Methenitis, Stamoulis Eds.
• «Basic Inorganic Chemistry» (Greek), N. Clouras, Travlos eds.
• "CHEMISTRY: STRUCTURE AND PROPERTIES," N.J. TRO, Paschalidis Eds.

Suggested Bibliography for the Laboratory:
• S. D. Koulocheri, LABORATORY EXERCISES IN PRINCIPLES OF GENERAL and INORGANIC CHEMISTRY, Agricultural University of Athens 2025.
• The theoretical part is available on e-class as PowerPoint presentations.