Inorganic Chemistry and Laboratory

1. Course number and name: 020CITNI4 Inorganic chemistry and Laboratory

2. Credits and contact hours: 4 ECTS credits, 2x1:15 contact hours

3. Name(s) of instructor(s) or course coordinator(s): Samar Kaddah**,** Fadel Chamseddine, Tala Kanson, Marie-José Zacca

4. Instructional materials: slides; in-class problems; lab experiments

5. Specific course information

a. Catalog description:

This course allows students to acquire solid skills in the field of crystallography: compact and pseudo-compact stacking of metals, interstitial sites, metallic alloys, and metallic bonds. In addition, this course allows to master basic notions on ionic solids through examples as well as on the solubility of a solid in binary systems through equilibrium diagrams. In addition, part of this course will be dedicated to the study of the physical and chemical properties of certain chemical elements. This course will be supplemented by laboratory work on the preparation of double salts and hydrogen peroxide, the determination of water hardness and the purification of calcium carbonate.

b. Prerequisites: None

c. Required/Selected Elective/Open Elective: Required

6. Specific goals for the course

a. Specific outcomes of instruction:

- Study the structure of the atom and the types of bonds (ionic, covalent, hydrogen, Van der Waals).
- Study the crystal structure of metals and the structural arrangement, the description of the crystal and the type of crystal lattices (CC, CFC, etc.), the stacking mode.
- Acquire basic notions on compactness.
- Study the properties of metal alloys and their types; patterns of energy bands.
- Master the concept of ionic solids through examples on the structure of compounds, interstitial sites including the physical and-chemical properties of ionic solids in terms of hardness, melting point and boiling point.
- Study the physical and chemical properties of hydrogen and industrial use, hydrogen derivatives and their action on oxides, salts, etc.
- Study the properties of oxygen and oxides through the characteristics of ozone and its oxidizing character, the degree of oxidation of oxygen and its industrial use, the oxidizing character of oxides.

- Study the physical and chemical properties of halogens and their industrial uses, their preparations and the degree of oxidation as well as the properties of oxacids and halogen oxides.
- Learn about the properties of iron and its oxides: allotropic variation of iron, potential-pH diagram of iron, properties of iron oxides (wustite, magnetite and hematite).
- Acquire basic notions on the steel industry in terms of preparation and refining of cast iron and industrial use, Chaudron and Boudouard balances.
- Learn the physical and chemical properties of sulfur and its derivatives, and their industrial uses.

From the laboratory work (preparation, observation, analysis and calculation), the student will learn the following points:

- Prepare double salts and calculate the yield of the product obtained.
- Make dilutions from a stock solution.
- Purify the calcium carbonate by Buchner filtration and calculate the quantity of product obtained.
- Determine the hardness of water by the complexion method and detect the equivalent point.
- Prepare hydrogen peroxide and titrate hydrogen peroxide with permanganate.

b. PIs addressed by the course:

PI	1.3	6.3	7.1
Covered	x	x	x
Assessed	x	x	

7. Brief list of topics to be covered

- Crystallography and type of cristal lattices/exercises (5 lectures)
- Metal alloys and their types/exercises (4 lectures)
- Ionic solids and exercises (4 lectures)
- Physical and chemical properties of selected elements (5 lectures)
- Laboratory work (6 sessions)