

## CHEM1.1: GENERAL CHEMISTRY I

### I. Course description:

1. **Credit points:** 3 ECTS

2. **Time commitment:**

Items	Lecture	Tutorial	Practical	Total
No. of hours	24	10	0	34

3. **Prerequisites:** High-school Chemistry

4. **Recommended background knowledge:** N/A

5. **Subject description:**

The General Chemistry I course provides fundamental knowledge on chemical composition and structure of matters.

6. **Objectives & Outcome:**

The students will learn the following concepts:

- Critical role of chemistry in modern fundamental and applied sciences, specially those are currently proposed at USTH.
- Electronic structure of atoms
- Periodic properties of elements
- Chemical bonds
- Structure of molecules and materials

7. **Assessment/ Evaluation**

Component	Attendance + Homeworks	Exercises	Assignments	Practical	Midterm	Final
Percentage %	10	0	Bonus up to 10% based on performance in TD section	0	40	50

8. **Prescribed Textbook(s):**

[1] Brown, LeMay, Bursten, Murphy, Woodward, Stoltzfus, Chemistry: The Central Science, 2015, 13<sup>th</sup> Edition, Pearson Education.

[2] Petrucci, Herring, Madura, Bissonnette, General Chemistry: Principles and Modern Application, 2011, 10<sup>th</sup> Edition, Pearson Canada

### II. Course content & schedule:

1. Introduction: Role of chemistry in modern sciences (with focus on those are currently proposed at USTH)
2. Matter and Measurement

- + Classification of matter
  - + Physical and chemical changes, separation of mixtures
  - + Units of measurement
3. Atoms
- + The atomic theory of Matter
  - + The discovery of Atomic structure
  - + The modern view of atomic structure (atomic number, mass, isotopes)
4. Electronic structure of atoms
- + The wave nature of light
  - + Quantized energy and photons
  - + Line spectra and the Bohr model
  - + Quantum mechanics and atomic orbitals
  - + Representations of orbitals
  - + Many electron atoms
  - + Electron configurations
  - + Electron configurations and the periodic table
5. Periodic properties of the elements
- + Development of the periodic table
  - + Effective nuclear charge
  - + Sizes of Atoms and Ions
  - + Ionization energy
  - + Electron affinity
6. Basic concepts of chemical bonding
- + Lewis symbols and the octet rule
  - + Ionic bonding
  - + Covalent bonding
  - + Bond polarity and electronegative
  - + Drawing Lewis structure
  - + Resonance structure

- + Exception of the octet rule
- + Strength and Lengths of covalent bonds
- 7. Molecular geometry and bonding theories
  - + Molecular shapes
  - + VSEPR Model
  - + Molecular shape and molecular polarity
  - + Covalent bonding and orbital overlap
  - + Hybrid orbitals
  - + Multiple bonds
  - + Molecular orbitals
- 8. Chemical reaction
  - + Theory of solutions and Solubility Rules
  - + Molecular and Ionic equations
  - + Types of chemical reactions : Precipitations; acid-base reactions; Oxidation – Reduction reactions
  - + Working with solution: Molar concentration; Diluting solution
  - + Quantitative analysis: Gravimetric analysis; Volumetric analysis

III. **Reference Literature: N/A**