

<b>Course</b>	Course Name	:	Chemistry
	Course Code	:	SK234102
	Credit	:	3
	Semester	:	1 (one)

### COURSE DESCRIPTION

This course studies the basic principles of chemistry including atomic theory, electron configuration, chemical bonds, state of matter and phase changes, chemical reactions and stoichiometric, Acid-Base Theory, Ionic Equilibrium in Solutions (Acid-Base, Solubility, Complexes, and Precipitation), Chemical Thermodynamics, Chemical Kinetics, and Electrochemistry.

### COURSE GRADUATE LEARNING OUTCOME

1. Able to report his/her own work in a good and disciplined manner (A.1/PLO 1)
2. Able to take responsibility for his/her own work and to give responsibility for the achievement of an organization (B.3/PLO 5)
3. Able to apply a chemistry mindset and utilize science and technology in their field and overcome problems that are faced. (D.1/PLO 8)

### COURSE LEARNING OUTCOME

1. The students should be able to use the principles of basic chemistry knowledge as a basis to learn chemistry which they will learn further throughout their whole studies.
2. The students should be able to do basic chemistry calculations.

### TOPIC

1. Atomic Structure
  - Introduction to matter (elements, compounds, physical properties, chemical properties)
  - The basic laws of combining elements (Proust, Lavoisier, Dalton)
  - Development of atomic models and structures
  - The underlying experiments (Dalton, Thompson, Rutherford, Bohr and the Hydrogen Atomic Spectrum)
  - The electron configuration of an element and an ion
  - Periodic System of Elements
  - The periodicity of the elements
2. Stoichiometry
  - Calculation of the concept of mole
  - Empirical formula and molecular formula
  - Concentration Units (M, N, %, m, F, ppm, ppb)
  - Stoichiometry in Solution
  - Standardization
3. Chemical Bond
  - Polar covalent and covalent bonds, dipole moments, metallic bonds, hydrogen bonds, and Van der Waals bonds
  - Molecular geometry and structure (Lewis structure, and hybridization)
4. State of Matter
  - Forms of Gases (Laws of gases and their physical properties)

- Liquid State (physical properties of liquids: vapor pressure, boiling point, surface tension, viscosity)
  - Colligative Properties of Solutions
  - Solids (Crystal lattice, simple simple cube, face centered cubic , body centered cubic , Miller index, Bragg equation)
5. Solution
- Acid-Base Theory (Arrhenius Theory, Brønsted-Lowry, Lewis Theory)
  - Degree of ionization and ionization constant
  - Acid Base Strength
  - Weak acid-base balance
  - Ionic equilibrium between solid and solution
  - Buffer System
  - Solubility
6. Thermodynamics
- Thermodynamics concepts (principles, states and processes)
  - First Law of Thermodynamics: internal energy, work and heat
  - Heat capacity, calorimetry and enthalpy
  - Second Law of Thermodynamics and spontaneity
  - Thermochemistry and its use to explain the spontaneity of chemical reactions
  - Calculations related to the Carnot engine application
7. Chemical equilibrium
- Concept of Chemical Equilibrium and Equilibrium Constant (Reaction quotient, equilibrium constant  $K_p$  and  $K_c$ )
  - Le Chatelier's Principle
  - Factors affecting chemical equilibrium
8. Chemical Kinetics
- Chemical kinetics concept
  - Rate in chemical reaction
  - Determination of reaction rate, order and rate constant of reaction
  - Effect of temperature on reaction rate
  - Elementary reaction
  - Catalyst
9. Electrochemistry
- Redox reaction concept
  - Electrochemical cell (electrode and electrolyte solution in electrochemical cell)
  - Effect of concentration and Nerst, equation
  - Use of electrochemical concepts for voltaic cell applications (battery and fuel cells) and electrolysis
  - Corrosion and corrosion prevention
10. Enrichment
- Topics according to the faculty's area of interest (per faculty)

## REFERENCES

1. Chemistry 1 (compiled by the Lecturer Team of the Department of Chemistry)
2. Oxtoby, DW, Gillis, HP and Campion, A. , "Principles of Modern Chemistry", 7th Edition, Brooks/Cole, 2012.
3. Chang, R. and Goldsby, K., "Chemistry", 11th Edition, McGraw-Hill, USA, 2012.
4. Goldberg, DE, "Fundamentals of Chemistry", 4th Edition, McGraw-Hill Companies, 2007.