Course Descriptor
Chem102, General Chemistry II

Proposed Academic Year	2021-2022	**Last Reviewed Academic Year**	2020-2021
Course Code	Chme102	**Course Title**	General Chemistry II
Credit hours	3	**Level of study**	Undergraduate
College / Centre	Applied and Health Sciences	**Department**	Basic Sciences
Co-requisites	CHEM101	**Pre-requisites**	CHEM181

1. COURSE OUTLINE

[This is an introductory Chemistry course focusing on the basic chemical principles and concepts that are needed for the understanding of Chemistry for students who have already cleared Chemistry-I. The course covers introductory concepts of covalent bonding including Valence Bond and Molecular Orbital theories, Introductory chemical kinetics and Chemical equilibria, Solutions and colloids, colligative properties, Solid state Chemistry, Acids and bases, basic Electrochemistry, Free energy and entropy concepts, and basics of Analytical Chemistry.

It is designed for students who will continue their undergraduate degree programs in Engineering and Applied Sciences.

2. AIMS

The primary objective in this course is to build a firm foundation in chemical science and the basic principles that allow one to make qualitative and quantitative inquiries into various topics in natural/physical sciences and to prepare the students to take up more advanced Chemistry course or Chemistry related courses. Another objective is to develop critical thinking, problem solving and communication skills in addition to develop concepts in specific topics such as bonding and geometry, chemical kinetics, equilibria, properties of liquids, solutions and solids, thermodynamics, electrochemistry, and analytical chemistry.

3. LEARNING OUTCOMES, TEACHING, LEARNING and ASSESSMENT METHODS

Learning Outcomes *(Definitive)* Upon successful completion of this course, students will be able to**:**	**Teaching and Learning methods *(Indicative)***	**Assessment *(Indicative)***
1. To have a better understanding on covalent bonding, VB and MO theories and the geometry of molecules.	*class lectures, work sheets,* lab work	*quiz 1/Assignment 1/ mid-term test -1/ Final exam*

2. Understanding the concept of intermolecular forces, properties of liquids and solution, types of solids and bonding in them.	Group work, Lecture, power point presentations, assignments	*quiz 1/Assignment 1/ mid-term test -1/ Final exam*
3. To get an idea of colligative properties, Raoult's law and Henry's law	Class lectures, power point presentations, discussions, problem based learning	Assignment 2/ *mid-term test 1/Final exam*
4. To understand on principles of chemical kinetics	Group work, Lecture, power point presentations, assignments	*Assignment 2/ mid-term test 1/ Final exam*
Conceptualize principles of Physical and Chemical equilibrium, and factors affecting them .	Class lectures, power point presentations, discussions, problem based learning	Assignment 2/ Midterm 1/ Final exam

4. ASSESSMENT WEIGHTING

Assessment	Percentage of final mark (%)
Mid-term Examination	20
Quizzes	10
Attendance, participation	10
Assignment/ Homework	20
Final Examination	40
TOTAL	**100%**

5. ACHIEVING A PASS

Students will achieve 3 credit hours for this course by passing ALL of the course assessments] and achieving a minimum overall score of 50%

6. COURSE CONTENT (Indicative)

1	Covalent bonding, Molecular structure - VSEPR model, Hybridization and localized electron model, sp^3, sp^2 and sp hybridization	3
2	Molecular orbital theory, molecular orbital energy level diagram, bond order, homo-nuclear diatomic molecules, Para-magnetism, Intermolecular forces – dipole-dipole and dispersion forces	3
2-3	hydrogen bonding ,The liquid state, surface tension and viscosity Introduction to structure and types of solids, X –ray diffraction and Bragg's equation,	3
3-4	Types of crystalline solids, ionic, covalent metallic and molecular solids, vapor pressure and change of state, Solution composition, energies of solution formation, Factors affecting solubility, structure effects, **Quiz 1+Assignment 1**	3
4-5	pressure effects and temperature effects, the vapor pressure of solutions, Colligative properties- boiling point elevation and freezing point depression, osmotic pressure,	3
6-7	Colloids and their properties ,– Reaction rates, Rates laws-an introduction, types of rate laws, determining the form of rate laws,	3
8	Method of initial rates, the integrated rate laws, first order rate law, second order rate law, half- life of first order reaction, Rate laws –a summary,	3
9	Chemical equilibrium-The equilibrium condition, equilibrium constant, equilibrium expressions involving pressure. Heterogeneous equilibria, application of equilibrium constant, solving equilibrium problems, Le Chatelier's principle. **Mid Term Exam**	3
10	The nature of acids and bases, different models, acid strengths, the pH scale, Calculating the pH of strong acid solution, Calculating the pH of week acid solution, Bases.	3
10-11	Acid-base properties of salts, Henderson equation, salts that produce neutral solution, Salts that produces basic solutions and acidic solutions, effect of structure on acid – base properties,	3

11	The Lewis acids – base model. Solutions of acids and bases containing common ions, Buffer solutions, and buffer capacity Solubility equilibria and solubility product, Spontaneous process and entropy, entropy and second law of thermodynamics, **Quiz 2 + Assignment 2**	3
11-12	Free energy, free energy and equilibrium. Galvanic cells, electrode potentials, standard electrode potential, cell potential, representing a cell –line notation, electrical work and free energy, dependence of cell potential on concentration, Nernst equation.	3
12-13	Basic concepts in Analytical Chemistry – accuracy and precision, Errors in Analysis, calibration, qualitative and quantitative analysis, acid –base indicators	3
12-13	Basic understanding on Chromatographic techniques and spectrophotometry. Revision	3
13	Final Exam	-
	TOTAL HOURS	**42**
1 - 15	Plus **RECOMMENDED INDEPENDENT STUDY HOURS**	**30**
	TOTAL COURSE HOURS	**72**

7. RECOMMENDED REFERENCES

Core text/s:

1. Chemistry by S.S. Zumdahl and S.A. Zumdhal (9th edition), 2014, Houghton Mifflin Company, MA, USA

2. Moodle

3. Library + online resources:
http://preparatorychemistry.com/Bishop_Chemistry_First.htm