Subject Description Form

Subject Code	ABCT1742
Subject Title	General Chemistry II
Credit Value	3
Level	1
Pre-requisite	General Chemistry I
Objectives	1. To introduce a molecular perspective for understanding the natural world 2. To identify the fundamental principles underlying any physical and chemical changes of matters 3. To visualize the physical and chemical changes through the understanding of molecular behavior
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) demonstrate the microscopic concepts of atomic structure and molecular bonding as well as their relationships with the general property trends of elements and compounds; (b) understand the macroscopic properties and basic principles of liquids and solutions; (c) apply and incorporate the chemical principles and knowledge learned to solve chemical problems and to appreciate modern applications in real life; (d) demonstrate the abilities in communication as well as skills in problem-solving and analytical thinking.
Subject Synopsis/ Indicative Syllabus	**Properties of Gases** The simple gas laws, Ideal Gas Equation and its application, non-ideal gases **Electrons in Atoms** Electromagnetic radiation, atomic spectra, quantum theory, the Bohr's atom, wave mechanics, uncertainty principle, quantum numbers and atomic orbitals, hydrogen atom and many electron atoms, electronic configurations **Periodic Table and Atomic Properties** Classification of chemical elements, sizes of atoms and ions, ionization energy, electronic affinity, magnetic properties, periodic properties of the elements **Chemical Bonding – Localized Electron Pair Approach**

<table>
<tr><td></td><td>Lewis theory and Octet rule, limitation of the Lewis theory, bond energies and bond distances, polar covalent bonds, VSEPR theory and molecular shapes of polyatomic molecules, physical properties and molecular shapes, Valence Bond theory

<u>Chemical Bonding – Delocalized Electron Pair Approach</u>
Principles of Molecular Orbital (MO) theory for homonuclear and heteronuclear diatomic molecules; bonding and antibonding molecular orbitals; MO energy-level diagrams; election configurations and physical properties (e.g. bond order, magnetism, etc), frontier orbitals, delocalized π-bonding in polyatomic molecules, Band theory of solids

<u>Intermolecular Forces and Properties of Liquids</u>
Dipole-dipole interaction, ion-dipole interaction, van der Waals forces, hydrogen bonding, physical properties of liquid (e.g. viscosity, surface tension), phase transition and energetics

<u>Chemistry of Transition Metals</u>
Electronic configurations and general properties of transition metals; co-ordination compounds; ligands and co-ordination numbers; formation constant for complex in equilibria; chelate effects; structure and isomerism of coordination compounds; crystal field splitting in complexes; color and magnetic properties of complexes; applications of co-ordination compounds</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures supplemented with guided reading will be used to introduce the key concepts of the topics. Homework or assignments would be given for students to enhance their learning. Tutorials will be arranged and students would be assigned in small groups for discussion.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td></td><td></td></tr>
<tr><td>1. Final examination</td><td>60</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>2. Tutorial assignment</td><td>5</td><td>√</td><td></td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>3. Tutorial participation</td><td>5</td><td>√</td><td></td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>2. Test X 2</td><td>30</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
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	The subject assessment includes two tests and one final examination. The final examination will be scheduled at the end of semester, while the tests will be scheduled during the teaching weeks. Students should refer to the teaching schedule released in the first teaching week. Apart from lectures, tutorials will be arranged to reinforce student's comprehension of the concepts and principles introduced in the lectures. Attendance of the tutorial classes is mandatory, and attendance record will be kept for reference. Students are expected to review any assigned learning materials (e.g., book chapters, videos, recordings on selected topics) and complete the homework assignments. To promote active learning, students will present their solutions during tutorials. Students' performance in the tutorial discussions will be graded and count toward the final scores	
Student Study Effort Expected	Class contact:	
	▪ Lectures	29 Hrs.
	▪ Tutorials	10 Hrs.
	Other student study effort:	
	▪ Self-study	60 Hrs.
	▪ Home work and assignments	21 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	**<u>Essential reading</u>** Petrucci, Herring, Madura and Biossonnette, *General Chemistry: Principle and Modern Applications*, 10th edition, 2011, Pearson	