

## Subject Description Form

<b>Subject Code</b>	ABCT3621
<b>Subject Title</b>	Chemical Principles for Testing and Analysis
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite</b>	NIL
<b>Objectives</b>	<ul style="list-style-type: none"> <li>▪ To introduce a molecular perspective for understanding the natural world.</li> <li>▪ To identify the fundamental principles underlying any physical and chemical changes of matters.</li> <li>▪ To visualize the physical and chemical changes through the understanding of molecular behavior.</li> <li>▪ To understand the basic principles and the applications of sampling techniques, titrimetric analysis, potentiometry and electroanalytical techniques.</li> </ul>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>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;</li> <li>b. apply and incorporate the chemical principles and knowledge learnt to solve chemical problems in chemical analysis;</li> <li>c. comprehend the fundamental concepts of electrochemistry and master the electroanalytical techniques, and apply them in industrial/testing laboratory;</li> <li>d. demonstrate the abilities in problem-solving and analytical thinking.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b><u>Properties of Gases</u></b> Simple gas laws, Ideal Gas Equation and its application, non-ideal gases</p> <p><b><u>Electrons in Atoms</u></b> Electromagnetic radiation, atomic spectra, hydrogen atom and many electron atoms, electronic configurations</p> <p><b><u>Periodic Table and Atomic Properties</u></b> Classification of chemical elements, sizes of atoms and ions, ionization energy, electronic affinity, magnetic properties, periodic properties of the elements</p> <p><b><u>Chemical Bonding – Localized Electron Pair Approach</u></b> 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</p> <p><b><u>Intermolecular Forces and Properties of Liquids and solids</u></b> Dipole-dipole interaction, ion-dipole interaction, van der Waals forces, hydrogen bonding, physical properties of liquid and solids.</p>

	<p><b><u>Chemistry of Transition Metals</u></b> Electronic configurations and general properties of transition metals; co-ordination compounds; ligands and co-ordination numbers;</p> <p><b><u>Electroanalytical Chemistry</u></b></p> <p>Brief review of Faraday Processes; Fundamental concepts of the electrical double layer; Phenomena associated with the properties of the double layer with adsorption.</p> <p>The Tafel equation and its interpretations of overpotentials; Kinetics of electrode reactions; Electrocatalysis; Mass transfer by migration, diffusion and forced convection.</p>																																							
<p><b>Teaching/Learning Methodology</b></p>	<p>Lectures supplemented with guided reading will be used to introduce the key concepts of the topics. Homeworks 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.</p>																																							
<p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p>	<table border="1" data-bbox="533 880 1482 1317"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1. written examination</td> <td>50</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>2. continuous assessment</td> <td>50</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> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p>		Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						a	b	c	d			1. written examination	50	✓	✓	✓	✓			2. continuous assessment	50	✓	✓	✓	✓			Total	100 %						
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**Reading List and  
References**

Petrucci, R.H.

General Chemistry: Principle and Modern Applications (10<sup>th</sup> ed.)  
Pearson 2017.

Christian, G.D.

Analytical Chemistry (6<sup>th</sup> ed.) Wiley 2003.

Skoog, D.A.; Holler, F.J. and Nieman T.A.

Principles of Instrumental Analysis (6<sup>th</sup> ed.) Brooks/Cole 2007.