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<tr><td>Level</td><td colspan="6">Level - 04</td></tr>
<tr><td>Course Synopsis
Course Code</td><td colspan="6">CYU4301</td></tr>
<tr><td>Course Title</td><td colspan="6">Concepts in Chemistry</td></tr>
<tr><td>Credit value</td><td colspan="6">03</td></tr>
<tr><td>Core/Optional</td><td colspan="6">Core and optional</td></tr>
<tr><td>Prerequisites</td><td colspan="6">Pass OR Valid OCAM in both CYU3300 and CYU3201</td></tr>
<tr><td rowspan="2">Hourly breakdown</td><td colspan="2">Theory</td><td>Practical hours</td><td>Independent Learning</td><td>Assessments</td><td>Total hrs</td></tr>
<tr><td>23 Sessions x 02 hrs = 46 hrs</td><td>2 DS x 08 hrs +1 DS x 04 hrs = 20 hrs</td><td>N/A</td><td>23 Sessions x 03 hrs +

13 hrs online = 82 hrs</td><td>2 CA x 01 hrs = 02 hrs</td><td>150 hrs</td></tr>
<tr><td>Course Aim/s.</td><td colspan="6">Develop an understanding of the microscopic processes that generate an absorption spectrum, develop the ability in solving problems associated with energy levels of a molecule, its spectrum and selection rules, develop the ability in solving problems involving the microwave spectrum of a diatomic molecule using the rigid rotor model, revisit basic concepts in kinetics to ensure a firm grasp of its fundamentals, develop an understanding of the kinetics of complex reactions, develop an understanding of the experimental methods used in determining rate law, develop the ability to solve problems associated with the rates of complex reactions, develop an understanding of conductivity of a solution in terms of ionic movement, develop the ability in solving problems involving the conductivity and molar conductivity of electrolytes using their relationship to ionic mobility and concentration, develop an understanding of phase diagrams, develop the ability in constructing a phase diagram from experimental data and develop the ability in problem solving using Raoults law and Dalton's law and phase diagrams.</td></tr>
<tr><td>PLOs addressed by course</td><td colspan="6">PLO1: Knowledge: Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the BSc degree.
PLO2: Practical Knowledge and Application. Acquire competency in practical skills and the necessary knowledge to appropriately use these skills.
PLO4: Individual Work, Team Work and Leadership: Function effectively as an individual, and as a team member, sharing work and experiences, leading and managing assigned tasks to completion on time, demonstrating leadership to address situations in diverse and multi-disciplinary environments in day to day life.
PLO5: Creativity and Problem Solving: Identify problems and argue out and analyze such problems using qualitative and/or quantitative practical approaches in scientific methodology to provide valid conclusions
PLO8: Vision for Life: Identify where one wants to be and develop long term goals maintaining competency to conduct scientific investigations and proceed to undertake further studies.
PLO9: Lifelong Learning: Foresee new trends and recognize their impact, and update knowledge and develop new skills to meet future changes and challenges.</td></tr>
<tr><td>Course Learning Outcomes (CLO)</td><td colspan="6">CLO 1: Describe generation of an absorption spectrum in terms of processes that occur at molecular level.
(PLO 01)
CLO 2: Solve problems associated with energy levels of a molecule, its spectrum and selection rules.
(PLO 01, 02, 04, 05 and 09)</td></tr>
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	CLO 3: Explain how the height and width of a spectral line is determined by the underlying microscopic processes. (PLO 02 & 04) CLO 4: Solve problems involving the microwave spectrum of a diatomic molecule using the rigid rotor model. (PLO 01, 02, 04 & 09) CLO 5: Giving examples describe what a complex reaction is. (PLO 01) CLO 6: Solve problems involving rates of complex reactions using steady state approximation. (PLO 01, 02, 04, 05 and 09) CLO 7: Describe experimental techniques used in determining the rate law. (PLO 01) CLO 8: Explain the conductivity of a solution in terms of the movement of ions. (PLO 01) CLO 9: Describe how to determine the ionic mobility and transport number of an ionic species experimentally. (PLO 01) CLO 10: Solve problems involving the conductivity and molar conductivity of electrolytes using their relationship to ionic mobility and concentration. ((PLO 01, 02, 04, 05 and 09) CLO 11: Explain how to determine the endpoint of an acid-base titration using conductiometry. (PLO 01) CLO 12: Describe the principles involved in constructing a phase diagram for an ideal and a non-ideal binary system. (PLO 01) CLO 13: Construct a phase diagram from experimental data of a binary system. (PLO 01) CLO 14: Solve problems using Raoults law and Dalton's law and phase diagrams. (PLO 01, 02, 04, 05 and 09) CLO 15: Demonstrate the ability to be a self-directed learner. (PLO 08 and 09)
Content **(Main topics, sub topics)**	**Let us learn how molecules produce spectra** Wave and particle natures of electromagnetic radiation; absorption of radiation and Beer-Lambert law; functionality of an absorption spectrometer; calculation of the dipole moment of a molecule; definition of a spectrum; relationship between energy transitions and spectral lines in an absorption spectrum; stimulated emission, stimulated absorption and spontaneous emission; factors that determine the number and height of spectral lines in a spectrum; pure rotational spectra of diatomic molecules. **Further study of speeds of reactions** Rate constant; rate equation/rate law; order of reactions; molecularity; elementary reaction; Arhennius equation and its applications; mechanisms and the rate determining step; catalysis**;** complex reactions including multi step, concurrent, parallel, simultaneous and consecutive reactions**;** reversible reactions; chain reactions; steady state approximation**;** methods to determine rate constant and order of a reaction leading to the rate law**;** experimental study of slow and fast reactions. **Let us learn how electrolytes conduct electricity in solutions** Conductivity and molar conductivity of electrolytes and ionic species in solution and their interrelationship; concentration dependence of conductivity and molar conductivity; ionic mobility; transport number; limiting molar conductivity; determination of the dissociation constant of a weak acid and the end-pint of an acid-base titration using conductiometry. **Phase changes and their equilibria** Phase rule, phase diagrams intensive and extensive variables; independent components; one component systems (water); ideal (binary) systems – Raoults Law and Daltons Law; temperature/vapour pressure/ composition curves; non ideal binary systems deviations from Raoults Law; fractional distillation of mixtures; vapour pressure/temperature composition curves; azeotropes, solid-liquid equilibria; simple eutectic systems; compound formation; congruent and incongruent melting points; partially miscible binary systems – solubility curve upper and lower critical temperatures; totally immiscible binary systems, steam distillation.
Teaching Learning methods (TL)	Self-learning: • Instructional material (IL) • Online activities (OL) Compulsory contact sessions: • Compulsory day-school (CDS) • Assessments: MCQs (MCQ), structured essay (SEQ) Non-compulsory contact sessions: • Day school (DS)

Assessment strategy	Overall Continuous Assessment Mark (OCAM): 40%	Final Assessment: 60%
	Continuous Assessment (CA); (60% Best NBT + 40% Other NBT) (02 hrs)	Final Evaluation Theory: 100% (02 hrs)
Recommended Readings:	1. Banwell C. N. and S. W. Mpoloka S. W., (1983), Fundamentals of Molecular Spectroscopy, McGraw-Hill Book Company 2. Atkins P. W, Physical Chemistry, (1994), Oxford University press, 5th edition 3. Levine I. N., (1975), Molecular Spectroscopy, John Wiley & Sons 4. Barrow G. M., Physical chemistry, McGraw-Hill, London 5. Levine I. N., Physical chemistry, McGraw-Hill, London	