

## Enquiry for Course Details

<b>CHEM2541 Introductory physical chemistry (6 credits)</b>	Academic Year	2020										
Offering Department	Chemistry	Quota										
Course Co-ordinator	Dr J Y Tang (2nd sem), Chemistry < jinyao@hku.hk >											
Teachers Involved	(Dr J Y Tang, Chemistry)											
Course Objectives	The course aims to provide a rigorous understanding of equilibrium thermodynamics and chemical kinetics. Students are required to apply mathematical skills (derivations and integrations) and basic physics to understand chemical reactions and related processes. Topics include the three laws of thermodynamics, thermodynamic properties of mixtures, solutions, chemical equilibrium, electrochemistry, rates of chemical reactions and reaction dynamics. Students will gain a good foundation of knowledge and skills for further study in Physical Chemistry.											
Course Contents & Topics	<p>Properties of Gases States of gases and the gas laws with applications. The First Law of Thermodynamics Basic concepts of work, heat, energy, expansion work, heat transactions, enthalpy and adiabatic changes and examples in relation to biochemistry and materials science. The Second and Third Laws of Thermodynamics Direction of spontaneous change, entropy and the Third Law of Thermodynamics. Simple Mixtures Thermodynamic description of mixtures, partial molar quantities, and chemical potentials of liquids. Activities of solvent, solute, regular solutions and ions in solution. Chemical Equilibrium Spontaneous chemical reactions, the Gibbs energy minimum and equilibrium. Response of equilibria to pressure, temperature. Electrochemistry Electrochemical cell, relationship of electrochemical potential to thermodynamic functions. Applications of electrochemistry in energy, material science, sensing. Molecules in Motion Molecular motion in gases and liquids, kinetic model, collisions with surfaces, the rate of effusion and transport properties, conductivities of electrolyte solutions. Rates of Chemical Reactions Empirical chemical kinetics including experimental methods, rates of reactions, integrated rate laws and temperature dependence of reactions and Reaction mechanism</p>											
Course Learning Outcomes	<p>On successful completion of this course, students should be able to:</p> <table border="1"> <tr> <td>CLO 1</td> <td>demonstrate knowledge and understanding of the properties of gases, molecules in motion and the rates of chemical reactions</td> </tr> <tr> <td>CLO 2</td> <td>understand and demonstrate knowledge of the three laws of thermodynamics</td> </tr> <tr> <td>CLO 3</td> <td>understand and apply the concepts of chemical equilibrium and the response of chemical equilibria to temperature and pressure</td> </tr> <tr> <td>CLO 4</td> <td>understand and demonstrate knowledge of electrochemistry and its relationship to thermodynamics, can build electrochemical cell and calculate thermodynamic functions from electrochemical reactions</td> </tr> <tr> <td>CLO 5</td> <td>demonstrate knowledge and understanding of basic reaction dynamics including reaction mechanism and how mechanism determines reaction rate law</td> </tr> </table>		CLO 1	demonstrate knowledge and understanding of the properties of gases, molecules in motion and the rates of chemical reactions	CLO 2	understand and demonstrate knowledge of the three laws of thermodynamics	CLO 3	understand and apply the concepts of chemical equilibrium and the response of chemical equilibria to temperature and pressure	CLO 4	understand and demonstrate knowledge of electrochemistry and its relationship to thermodynamics, can build electrochemical cell and calculate thermodynamic functions from electrochemical reactions	CLO 5	demonstrate knowledge and understanding of basic reaction dynamics including reaction mechanism and how mechanism determines reaction rate law
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Pre-requisites (and Co-requisites and Impermissible combinations)	<p>Pass in CHEM1042; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042 and CHEM1043; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)</p>											
Course Status with Related Major/Minor /Professional Core	<p>2020 Major in Chemistry ( Core/Compulsory ) 2020 Major in Chemistry (Intensive) ( Core/Compulsory ) 2020 Minor in Chemistry ( Disciplinary Elective ) 2019 Major in Chemistry ( Core/Compulsory ) 2019 Major in Chemistry (Intensive) ( Core/Compulsory ) 2019 Minor in Chemistry ( Disciplinary Elective ) 2018 Major in Chemistry ( Core/Compulsory ) 2018 Major in Chemistry (Intensive) ( Core/Compulsory ) 2018 Minor in Chemistry ( Disciplinary Elective ) 2017 Major in Chemistry ( Core/Compulsory ) 2017 Major in Chemistry (Intensive) ( Core/Compulsory ) 2017 Minor in Chemistry ( Disciplinary Elective ) 2016 Major in Chemistry ( Core/Compulsory ) 2016 Major in Chemistry (Intensive) ( Core/Compulsory ) 2016 Minor in Chemistry ( Disciplinary Elective )</p>											

Course to PLO Mapping	2020 Major in Chemistry < PLO 1,2,3,5 > 2020 Major in Chemistry (Intensive) < PLO 1,2,3,5 > 2019 Major in Chemistry < PLO 1,2,3,5 > 2019 Major in Chemistry (Intensive) < PLO 1,2,3,5 > 2018 Major in Chemistry < PLO 1,2,3,5 > 2018 Major in Chemistry (Intensive) < PLO 1,2,3,5 > 2017 Major in Chemistry < PLO 1,2,3,5 > 2017 Major in Chemistry (Intensive) < PLO 1,2,3,5 > 2016 Major in Chemistry < PLO 1,2,3,5 > 2016 Major in Chemistry (Intensive) < PLO 1,2,3,5 >			
Offer in 2020 - 2021	Y	2nd sem	Examination	May
Offer in 2021 - 2022	Y			
Course Grade	A+ to F			
Grade Descriptors	A	Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.		
	B	Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations.		
	C	Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations.		
	D	Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.		
	Fail	Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Show evidence of little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems.		
Course Type	Lecture-based course			
Course Teaching & Learning Activities	<b>Activities</b>	<b>Details</b>	<b>No. of Hours</b>	
	Lectures		36	
	Tutorials		12	
	Reading / Self study		100	
Assessment Methods and Weighting	<b>Methods</b>	<b>Details</b>	<b>Weighting in final course grade (%)</b>	<b>Assessment Methods to CLO Mapping</b>
	Assignments		30	CLO 1,2,3,4
	Examination		50	CLO 1,2,3,4
	Test		20	CLO 1,2
Required/recommended reading and online materials	"Physical Chemistry" by P. W. Atkins, latest edition			
Course Website	NIL			
Additional Course Information				

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