

Enquiry for Course Details

CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6 credits)		Academic Year	2023
Offering Department	Chemistry	Quota	50
Course Co-ordinator	Dr J Yang, Chemistry < juny@hku.hk >		
Teachers Involved	(Dr J Yang, Chemistry)		
Course Objectives	The course presents fundamental principles and topics on statistical thermodynamics and kinetic theory in order to provide a solid foundation for students intending to further their studies in physical chemistry and related fields.		
Course Contents & Topics	Principles of Statistical Thermodynamics - Statistical model and state distribution for thermodynamics - Statistical entropy - Ensembles and partition functions: microcanonical and canonical - Systems of independent molecules: ideal gas - Molecular degrees of freedom: translation, rotation, vibration, and electronic - Ideal gas mixture: chemical equilibrium - Calculation of free energies in gaseous reaction Chemical equilibrium and kinetics theory - Rate theory: collision theory, transition state theory and applications		
Course Learning Outcomes	On successful completion of this course, students should be able to:		
	CLO 1	understand and use the terminology and nomenclature in statistical thermodynamics and topics discussed in the course	
	CLO 2	demonstrate knowledge and understanding of basic concepts in statistical thermodynamics	
	CLO 3	understand correlation between macroscopic observables and microscopic statistical model systems	
Pre-requisites (and Co-requisites and Impermissible combinations)	Pass in CHEM2541		
Course Status with Related Major/Minor /Professional Core	2023 Major in Chemistry (Intensive) (Core/Compulsory) 2023 Minor in Chemistry (Disciplinary Elective) 2022 Major in Chemistry (Intensive) (Core/Compulsory) 2022 Minor in Chemistry (Disciplinary Elective) 2021 Major in Chemistry (Intensive) (Core/Compulsory) 2021 Minor in Chemistry (Disciplinary Elective) 2020 Major in Chemistry (Intensive) (Core/Compulsory) 2020 Minor in Chemistry (Disciplinary Elective) 2019 Major in Chemistry (Intensive) (Core/Compulsory) 2019 Minor in Chemistry (Disciplinary Elective)		
Course to PLO Mapping	2023 Major in Chemistry (Intensive) < PLO 1,2,3,4,5 > 2022 Major in Chemistry (Intensive) < PLO 1,2,3,4,5 > 2021 Major in Chemistry (Intensive) < PLO 1,2,3,4,5 > 2020 Major in Chemistry (Intensive) < PLO 1,2,3,4,5 > 2019 Major in Chemistry (Intensive) < PLO 1,2,3,4,5 >		
Offer in 2023 - 2024	Y	2nd sem	Examination May
Offer in 2024 - 2025	Y		
Course Grade	A+ to F		
Grade Descriptors	A	Thorough mastery at an advanced level of extensive knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of strong analytical / critical abilities and logical thinking. Can apply the knowledge to practical questions in Physical Chemistry.	
	B	Substantial command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical / critical abilities and logical thinking. Understand the scope of Physical Chemistry questions that can be applied with the knowledge.	
	C	General but incomplete command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical thinking. Can apply the knowledge to familiar situations.	
	D	Partial but limited command of knowledge of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate limited evidence of analytical thinking. Understand the question to be solved with knowledge.	
	Fail	Little or no evidence of command of knowledge of statistical thermodynamics and reaction dynamics.	
Course Type	Lecture with laboratory component course		
Course Teaching & Learning Activities	Activities	Details	No. of Hours
	Laboratory		24
	Lectures		24
	Tutorials		4
	Reading / Self study		100

Assessment Methods and Weighting	Methods	Details	Weighting in final course grade (%)	Assessment Methods to CLO Mapping
	Assignments		50	CLO 1,2,3
	Examination		50	CLO 1,2,3
Required/recommended reading and online materials	P. Atkins: Physical Chemistry (10th edition) K.A. Dill & S. Bromberg: Molecular driving forces: statistical thermodynamics in biology, chemistry, physics and nanoscience (2nd edition) B. Widom: Statistical Mechanics: a concise introduction to chemists L. Nash: Elements of statistical thermodynamics (2nd edition)			
Course Website	Nil			
Additional Course Information	There are three mandatory homework assignments. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course. Students are strongly recommended to take CHEM3541 Physical Chemistry: Introduction to Quantum Chemistry before taking this course.			