

Enquiry for Course Details

CHEM4543 Advanced physical chemistry (6 credits)		Academic Year	2023
Offering Department	Chemistry	Quota	40
Course Co-ordinator	Prof G H Chen, Chemistry < ghc@yangtze.hku.hk >		
Teachers Involved	(Prof D L Phillips, Chemistry) (Prof G H Chen, Chemistry)		
Course Objectives	This course covers advanced topics in physical chemistry. It is offered for students majoring in physical chemistry and for students who are interested in postgraduate studies.		
Course Contents & Topics	Time-resolved spectroscopy methods, excited states and reactive intermediates, photophysics and photochemical processes, chemical reaction mechanisms, advanced quantum mechanical methods, reaction pathways and surface crossings.		
Course Learning Outcomes	On successful completion of this course, students should be able to:		
	CLO 1	understand the basic concepts of quantum chemistry, statistical thermodynamics and molecular dynamics	
	CLO 2	understand Hartree-Fock method, statistical ensembles, quantum statistics, H-theorem, and reaction dynamics	
	CLO 3	understand the elementary numerical procedures in Hartree-Fock and molecular mechanics methods	
Pre-requisites (and Co-requisites and Impermissible combinations)	Pass in CHEM3541		
Course Status with Related Major/Minor /Professional Core	2023 Major in Chemistry (Disciplinary Elective) 2023 Major in Chemistry (Intensive) (Disciplinary Elective) 2023 Minor in Chemistry (Disciplinary Elective) 2022 Major in Chemistry (Disciplinary Elective) 2022 Major in Chemistry (Intensive) (Disciplinary Elective) 2022 Minor in Chemistry (Disciplinary Elective) 2021 Major in Chemistry (Disciplinary Elective) 2021 Major in Chemistry (Intensive) (Disciplinary Elective) 2021 Minor in Chemistry (Disciplinary Elective) 2020 Major in Chemistry (Disciplinary Elective) 2020 Major in Chemistry (Intensive) (Disciplinary Elective) 2020 Minor in Chemistry (Disciplinary Elective) 2019 Major in Chemistry (Disciplinary Elective) 2019 Major in Chemistry (Intensive) (Disciplinary Elective) 2019 Minor in Chemistry (Disciplinary Elective)		
Course to PLO Mapping	2023 Major in Chemistry < PLO 1,2,3,5 > 2023 Major in Chemistry (Intensive) < PLO 1,2,3,5 > 2022 Major in Chemistry < PLO 1,2,3,5 > 2022 Major in Chemistry (Intensive) < PLO 1,2,3,5 > 2021 Major in Chemistry < PLO 1,2,3,5 > 2021 Major in Chemistry (Intensive) < PLO 1,2,3,5 > 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 >		
Offer in 2023 - 2024	Y	2nd sem	Examination May
Offer in 2024 - 2025	Y		
Course Grade	A+ to F		
Grade Descriptors	A	Mastery of advanced knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Strong analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.	
	B	Substantial command of a broad range of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Evidence of analytical and critical abilities and logical thinking, with ability to apply knowledge to practical problems in physical chemistry.	
	C	Command of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Evidence of some analytical and critical abilities and logical thinking, with ability to apply knowledge to familiar problems in physical chemistry.	
	D	Partial but limited command of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Evidence of some coherent analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.	
	Fail	Little or no evidence of command of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Lack of analytical and critical abilities and logical thinking, with very little or no ability to apply knowledge to practical problems in physical chemistry.	
Course Type	Lecture-based course		

Course Teaching & Learning Activities	Activities	Details	No. of Hours	
	Lectures		36	
	Tutorials	tutorials/discussion	12	
	Reading / Self study		100	
Assessment Methods and Weighting	Methods	Details	Weighting in final course grade (%)	Assessment Methods to CLO Mapping
	Assignments	(continuous assessment/test)	50	CLO 1,2,3
	Examination		50	CLO 1,2,3
Required/recommended reading and online materials	P. W. Atkins: Physical Chemistry Ira N. Levine: Quantum Chemistry (Prentice Hall, 4th ed.) R. C. Tolman: The Principles of Statistical Mechanics R. D. Levine, R. B. Bernstein: Molecular Reaction Dynam			
Course Website	Nil			
Additional Course Information	This course is also offered to RPg students, and the course code for RPg students is CHEM6112.			