

Enquiry for Course Details

CHEM4241 Modern chemical instrumentation and applications (6 credits)		Academic Year	2021												
Offering Department	Chemistry	Quota	50												
Course Co-ordinator	Dr I K Chu, Chemistry < ivankchu@hku.hk >														
Teachers Involved	(Dr I K Chu, Chemistry) (Dr K Okuro, Chemistry)														
Course Objectives	The aim of the course is to provide an understanding of modern instrumentation, covering both fundamental principles and practical aspects of instrument design. The course will be of particular benefit to those pursuing a higher research degree or a career in technical sales/service.														
Course Contents & Topics	<p>Biological Mass spectrometry: Liquid Chromatography-Tandem Mass Spectrometry for Proteomics & Metabolomics.</p> <p>Laser Spectroscopy: Principle of laser; three-level and four-level lasers; laser instrumentation (Q-switching and frequency conversion); laser-induced fluorescence; laser atomic spectrometry; laser remote sensing; signal-to-noise enhancement by boxcar integration and photon counting.</p> <p>Laser-based Colloid Particle Analysis: Dynamic light scattering; zeta-potential measurement; laser trapping (optical tweezers).</p> <p>Laser Microscopy: Confocal laser scanning microscopy; super-resolution microscopy; fluorescence correlation spectroscopy.</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>explain the principles of the modern mass spectrometric methods for proteins and metabolites identification and quantification</td> </tr> <tr> <td>CLO 2</td> <td>explain how proteins are identified and sequenced experimentally and how data is generated in proteomics experiments</td> </tr> <tr> <td>CLO 3</td> <td>use the database searching techniques and software tools to analyze high-throughput proteomics data</td> </tr> <tr> <td>CLO 4</td> <td>apply LC/MS/MS method for target quantitative analysis of small molecules</td> </tr> <tr> <td>CLO 5</td> <td>explain the principles of the laser spectroscopy, atomic plasma spectrometry, and atomic x-ray spectrometry</td> </tr> <tr> <td>CLO 6</td> <td>describe the basic experimental set up and the properties of the basic components of the instruments used in the laboratory classes</td> </tr> </table>			CLO 1	explain the principles of the modern mass spectrometric methods for proteins and metabolites identification and quantification	CLO 2	explain how proteins are identified and sequenced experimentally and how data is generated in proteomics experiments	CLO 3	use the database searching techniques and software tools to analyze high-throughput proteomics data	CLO 4	apply LC/MS/MS method for target quantitative analysis of small molecules	CLO 5	explain the principles of the laser spectroscopy, atomic plasma spectrometry, and atomic x-ray spectrometry	CLO 6	describe the basic experimental set up and the properties of the basic components of the instruments used in the laboratory classes
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Pre-requisites (and Co-requisites and Impermissible combinations)	Pass in CHEM3241														
Course Status with Related Major/Minor /Professional Core	2021 Major in Chemistry (Disciplinary Elective) 2021 Major in Chemistry (Intensive) (Core/Compulsory) 2021 Minor in Chemistry (Disciplinary Elective) 2020 Major in Chemistry (Disciplinary Elective) 2020 Major in Chemistry (Intensive) (Core/Compulsory) 2020 Minor in Chemistry (Disciplinary Elective) 2019 Major in Chemistry (Disciplinary Elective) 2019 Major in Chemistry (Intensive) (Core/Compulsory) 2019 Minor in Chemistry (Disciplinary Elective) 2018 Major in Chemistry (Disciplinary Elective) 2018 Major in Chemistry (Intensive) (Core/Compulsory) 2018 Minor in Chemistry (Disciplinary Elective) 2017 Major in Chemistry (Disciplinary Elective) 2017 Major in Chemistry (Intensive) (Core/Compulsory) 2017 Minor in Chemistry (Disciplinary Elective)														
Course to PLO Mapping	2021 Major in Chemistry < PLO 2,4,5 > 2021 Major in Chemistry (Intensive) < PLO 2,4,5 > 2020 Major in Chemistry < PLO 2,4,5 > 2020 Major in Chemistry (Intensive) < PLO 2,4,5 > 2019 Major in Chemistry < PLO 2,4,5 > 2019 Major in Chemistry (Intensive) < PLO 2,4,5 > 2018 Major in Chemistry < PLO 2,4,5 > 2018 Major in Chemistry (Intensive) < PLO 2,4,5 > 2017 Major in Chemistry < PLO 2,4,5 > 2017 Major in Chemistry (Intensive) < PLO 2,4,5 >														
Offer in 2021 - 2022	Y 1st sem	Examination	Dec												
Offer in 2022 - 2023	Y														
Course Grade	A+ to F														

Grade Descriptors	A	Demonstrate thorough knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemical instrumentations and applications. Show strong ability to apply and integrate knowledge and theory, and strong ability to analyze problems related to fundamental principles and practical aspects of instrument design.		
	B	Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemical instrumentations and applications. Show evidence to apply and integrate knowledge and theory, and ability to analyze problems related to fundamental principles and practical aspects of instrument design.		
	C	Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemical instrumentations and applications. Show evidence of some abilities to apply and integrate knowledge and theory, and to analyze problems to most familiar situations to fundamental principles and practical aspects of instrument design.		
	D	Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemical instrumentations and applications. Show evidence of limited abilities to apply and integrate knowledge and theory, and limited ability to analyze problems to most familiar situations related to fundamental principles and practical aspects of instrument design.		
	Fail	Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemical instrumentations and applications. Show little or no evidence of abilities to apply and integrate knowledge and theory, and little or no ability to analyze problems to most familiar situations related to fundamental principles and practical aspects of instrument design.		
Course Type	Lecture with laboratory component course			
Course Teaching & Learning Activities	Activities	Details	No. of Hours	
	Laboratory		16	
	Lectures		24	
	Tutorials		12	
	Reading / Self study		100	
Assessment Methods and Weighting	Methods	Details	Weighting in final course grade (%)	Assessment Methods to CLO Mapping
	Assignments		10	CLO 1,2,3,4,5,6
	Examination		60	CLO 1,2,3,4,5,6
	Laboratory reports	(lab performance, reports)	20	CLO 6
	Test		10	CLO 1,2,3,4,5,6
Required/recommended reading and online materials	Chhabil Dass: Fundamentals of contemporary mass spectrometry (Wiley-Interscience) D.A. Skoog, F.K. Holler, S.R. Crouch: Principles of Instrumental Analysis (Thomson, latest edition) Reference to published material will be made throughout the course.			
Course Website	NIL			
Additional Course Information	Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course. This course is also offered to RPg students, and the course code for RPg students is CHEM6117.			