The Hong Kong Polytechnic University

Subject Description Form

Subject Code	ABCT612
Subject Title	Advanced Chemical Instrumentation for Research
Credit Value	Three
Level	6
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	The course will provide the student with principles and practice of some advanced and widely used research techniques and instrumental methods in chemistry. Selected topics cover electronic spectroscopy, vibrational spectroscopy, laser based time-resolved spectroscopy, nuclear magnetic resonance, mass spectrometry, MS chromatography coupling, tandem MS. The course will introduce to the students the basic concepts, working principles and specific capabilities of the different chemical instrumentations with examples in the fields of chemistry, medical and environmental sciences. Concept and latest development in time-resolved spectroscopy will also be discussed.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) demonstrate a good understanding on the working principles and applications of electronic spectroscopy, vibrational spectroscopy, laser based time-resolved spectroscopy, nuclear magnetic resonance, mass spectrometry, MS chromatography coupling, tandem MS b) recognize deeply the advantages and limitations of the research techniques c) know how to justify the selection of the most appropriate instrumental methods or their combination to perform a given research task
Subject Synopsis/ Indicative Syllabus	UV-Vis absorption, fluorescence spectroscopy, Raman spectroscopy, Fourier transfer infrared spectroscopy, continuous wave laser, pulsed laser, time-resolved spectroscopy with time window ranging from femtosecond to millisecond (including: time-resolved fluorescence, transient absorption, time-resolved resonance Raman, fluorescence photon counting, laser flash photolysis), nuclear magnetic resonance, mass spectrometry, electron impact, fast atom bombardment, chemical ionization, electrospray, laser desorption, quadrupole mass analyzer, quadrupole ion trap, Time-of-flight, Fourier transform ion cyclotron resonance, hybrid instruments, gas-chromatography-MS, liquid-chromatography-MS, tandem mass spectrometry.
Teaching/Learning Methodology	The core information on different topics will be presented and explained in lectures. During lectures, active participation and independent thinking is encouraged to enhance students' interest. Assignments will be made to assess the students' understanding of the subject expected from the learning outcomes and to test their abilities to apply and extend the related knowledge.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c			
1. Continuous Assessment	30 %	✓	✓	✓			
2. Final Examination	70 %	✓	✓	✓			
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The course is designed to add significantly the scientific knowledge of advanced chemical instrumentations to students. Thus, continuous assessment and examination are suitable for assessing their progress.

Student Study Effort Expected

Class contact:	
▪ Lecture & Tutorial	39 Hrs.
Other student study effort:	
▪ Self Study	81 Hrs.
Total student study effort	120 Hrs.

Reading List and References

1. Principles of instrumental analysis; D. A. Skoog, F. J. Holler, S. R. Crouch; (Thomson, 2007, 6th Ed.).
2. An introduction to laser spectroscopy; D. L. Andrews, A. A. Demidov; (Kluwer Academic / Plenum Publishers, 2002, 2nd Ed.).
3. Laser spectroscopy; W. Demtroder; (Springer-Verlag, 2008, 4th Ed).
4. Mass spectrometry: principles and applications; E. de Hoffmann, V. Stroobant; (Chichester ; New York : John Wiley, 2001).