City University of Hong Kong
Course Syllabus

offered by Department of Physics
with effect from Semester B 2017/18

Part I Course Overview

Course Title:	**Instrumental Methods of Analysis and Laboratory**
Course Code:	**AP5301**
Course Duration:	**One semester**
Credit Units:	**3**
Level:	**P5**
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites: *(Course Code and Title)*	**Nil**
Precursors: *(Course Code and Title)*	**Nil**
Equivalent Courses: *(Course Code and Title)*	**Nil**
Exclusive Courses: *(Course Code and Title)*	**AP8301 Instrumental Methods of Analysis and Laboratory**

Part II Course Details

1. Abstract

To provide fundamental and practical understanding of materials characterization techniques.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Describe the physical principles of various analytical instruments.			√	
2.	Apply physical principles to the structural design of each element of the instruments, in particular to those involving electron beam and ion beam.			√	
3.	Apply selected analytical techniques to common applications.				√
		100%			

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4			
Lectures	Explain the relevant concepts and applications	√	√	√				
Term Paper	Apply the knowledge to solve practical problems	√	√	√				
Laboratories	Conduct relevant experiments to obtain practical understanding	√	√	√				

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4				
Continuous Assessment: 50%								
Laboratories	√	√	√				35%	
Term Paper	√	√	√				15%	
Examination: 50% (duration: 2 hours)								
							100%	

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Laboratory and Term Paper	Ability to understand and explain the relevant materials	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Final Examination	Ability to understand and explain the relevant materials	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

- Overview of analytical techniques
- Optical Microscopy
- Electron Microscopy
- X-ray analysis
- Diffraction techniques
- Scanning probe microscopy
- Surface techniques
- Ion beam techniques
- Nondestructive techniques

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Encyclopedia of Materials Characterization, edited by C Richard Brundle, Charles A Evans, Jr, and Shaun Wilson, Butterworth-Heinemann (1992)

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	X-ray Microanalysis in the Electron Microscope (4th Edition), by J A Chandler, North Holland (1987)
2.	Methods of Surface Analysis: Techniques and Applications, edited J M E Walls, Cambridge University Press (1990)
3.	Secondary Ion Mass Spectrometry, by Benninghoven, Rudenauer, and Werner, John Wiley & Sons (1987)
4.	Surface Analytical Techniques, by J C Riviere, Oxford University Press (1990)
5.	Modern Techniques of Surface Science, by D P Woodruff and T A Delchar, Cambridge University Press (1994)
6.	Analysis of Microelectronic Materials and Devices, edited by M. Grasserbauer and H W Werner, John Wiley & Sons (1991)