Attachment III

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	AP617
Subject Title	Advanced Instrumentation for Materials Analysis
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	None
Objectives	To introduce knowledge in advanced instrumentation for materials analysis to research students from different disciplines.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) provide students with an understanding of the principles and applications of a selected range of advanced instruments for materials analysis, b) understand the methodology of materials testing for quality assurance and failure analysis, and c) develop students' experimental skills through laboratory work experience.
Subject Synopsis/ Indicative Syllabus	• Overview of the principles and techniques in materials characterization and failure analysis; testing codes and standards. • Non-destructive testing methods: dye penetration, magnetic particles inspection, eddy currents. Ultrasonics and radiography. • Mechanical and thermal techniques: dynamic mechanical analysis, thermomechanical analysis, differential scanning calorimetry. • Microscopy: TEM, SEM, AFM, SAM and SLAM. • Other structural, chemical and surface analyses: XRD, FTIR, Raman spectroscopy, RHEED, RBS, EDX, LIMS and other novel techniques using plasma and post-ionization. • Hands-on experiments of using some of the available advanced instruments/facilities in our research centers.
Teaching/Learning Methodology	In order to stimulate and motivate the students' interest in the study of material science and related topics, Hand-on experiments will be offered for students to gain experience on the characterization of the electrical and physical properties of some materials.

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	d	e	
1. Examination	60	✓	✓	✓			
2. Continuous assessment	40	✓	✓	✓			
Total	100 %						

Students should have a) a basic understanding on the operation principle of some advanced instruments, b) gained knowledge in the quality assurance and failure analysis of material analysis, and c) developed experimental skills throughout the studies – these are the intended learning outcomes.

Assignments will strengthen the students' basic knowledge and the analytical skill to solve the problems related to different advanced measurement techniques for materials. Tests will review their understanding of the course and examination will accelerate their knowledge's understanding and improve their manipulation on problem solving. Hence, the proposed assessment methods are necessary to assess the intended learning outcomes (i.e., items a, b, & c).

Student Study Effort Expected

Class contact:	
▪ Lectures/Seminar	27 Hrs.
Other student study effort:	
▪ Self-study	81 Hrs.
▪ Laboratory	12 Hrs.
Total student study effort	120 Hrs.

Reading List and References

- Chuck Hellier,' Handbook of Nondestructive Evaluation', McGraw-Hill, 2001.
- Peter J. Shull (Ed.),' Nondestructive Evaluation', Marcel Dekker, 2002.
- Frank H. Chung and Deane K. Smith,' Industrial Applications of X-ray Diffraction', Marcel Dekker, 1999.
- Joseph I. Goldstein,' Scanning Electron Microscopy and X-Ray Microanalysis: A Text for Biologists, Materials Scientists, and Geologists', Second Edition, Kluwer Academic, Publishers, 1992.
- Charles E. Lyman, *etal*,' Scanning Electron Microscopy, X-Ray Microanalysis and Analytical Electron Microscopy: A Laboratory Workbook', Plenum Press, 1990.