

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:	Nanomaterials
Course Code:	AP5302
Course Duration:	One Semester
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: <i>(Course Code and Title)</i>	Nil
Precursors: <i>(Course Code and Title)</i>	Nil
Equivalent Courses: <i>(Course Code and Title)</i>	Nil
Exclusive Courses: <i>(Course Code and Title)</i>	AP8302 Nanomaterials

Part II Course Details

1. Abstract

This course will enable students to appreciate and recognize the difference in physical properties of nanomaterials as compared to their bulk counterparts. It will provide students with the knowledge on physical properties, major classes, synthesis and processing, characterisation techniques and selected applications of nanomaterials.

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.	Recognize and explain the differences in physical properties of nanomaterials as compared to the bulk counterparts			√	
2.	Understand and apply methodologies and techniques of synthesis, processing and characterization of major classes of nanomaterials		√		
3.	Recognize major application areas of nanomaterials and be able to generate creative solutions for different applications				√
4.	Demonstrate the capacity for self-directed learning on topics related to the design, use and research of nanomaterials in the contemporary world		√	√	
		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			
Lecture	Understand key concepts and engage in inquiry	√	√	√	√			2 hrs/wk
Tutorial activity	Demonstrate the capability of analysis and critical thinking; appreciate the essence of research	√	√	√	√			1 hrs/wk
Homework	Analyse creative works, including original research publications, and generate work with new concepts	√	√		√			0.5 hrs/wk

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: 20%								
Active class participation	√	√	√	√			5%	
Discussion at tutorial	√	√	√				5%	
Quiz and homework essay	√	√		√			10%	
Examination: 80% (duration: 2 hrs)								
							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. Discussion at tutorial	CAPACITY for SELF-DIRECTED LEARNING to understand the principles	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Quiz	ABILITY to EXPLAIN methodologies	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Homework essay	ABILITY to GENERATE new concepts	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Final examination	ALL above	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

(An indication of the key topics of the course.)

- **Physical properties of nanomaterials as compared to the bulk counterparts**
Electronic structure of solids, electrical, magnetic, optical properties
- **Major classes of nanomaterials**
Semiconductor quantum dots, metal nanoparticles, 1D nanomaterials, carbon-based nanomaterials, coatings and thin films
- **Synthesis and processing technologies of nanomaterials**
Top-down and bottom-up approach, lithography, physical vapour deposition, chemical vapour deposition, colloidal synthesis, assembly and self-assembly
- **Characterisation methods of nanomaterials**
Structure analysis: microscopy methods, diffraction methods; optical spectroscopy based methods
- **Application areas of nanomaterials**
Medicine, energy, photocatalysis

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.)

N/A

2.2 Additional Readings

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

1.	“Understanding Solids: The Science of Materials”, Richard Tilley, Wiley 2004 (ISBN: 0-470-85275-5)
2.	“Nanostructures & Nanomaterials: Synthesis, Properties and Applications”, Guozhong Cao, Imperial College Press 2004 (ISBN: 1-86094-480-9)
3.	“Nanotechnology: A Chemical Approach to Nanomaterials”, Geoffrey Ozin & Andre Arsenault, RSC Publishing 2005 (ISBN: 0-85404-664-X)