City University of Hong Kong
Course Syllabus

offered by
Department of Mechanical Engineering
with effect from Semester A 2024 / 25

Part I Course Overview

Course Title: Nano-manufacturing

Course Code: MNE8104

Course Duration: One Semester

Credit Units: 3

Level: R8

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)* MNE6046 Nano-manufacturing

Exclusive Courses: *(Course Code and Title)* Nil

Part II Course Details

1. Abstract

More than $2 trillion/year by 2030 in new technologies and products and 2 million jobs have been projected by nanotechnology. Nanomanufacturing is crucial to bring nanotechnology out of the laboratory into the factory for commercial scale-up and applications. This course aims to introduce the modern multidisciplinary nanomanufacturing to the students and get them prepared for the new industrial revolution led by rapid progresses in nanotechnology. It covers important topics in nanomanufacturing such as top-down and bottom-up manufacturing, reliability and defect control, and many key issues on how to conduct nanomanufacturing today and overcome its many technical barriers. Moreover, this course will also promote discovery learning through Web 2.0.

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 basic knowledge of nanotechnology and nanomanufacturing.	10%		✓	✓
2.	**Explain** the main techniques and processes of nanomanufacturing.	40%		✓	✓
3.	**Apply** nanomanufacturing techniques to perform synthesis and characterization of nanowires/rods.	25%		✓	✓
4.	**Discover** interesting application(s) of the synthesized nanowires/rods.	25%	✓	✓	✓
		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 real-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. Learning and Teaching Activities (LTAs)

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

LTA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Students will engage in formal lectures on the topics of the keyword syllabus and promote discovery learning through Web 2.0.	√	√	√	√	26 hours
Laboratory/ Tutorial	Students will engage in lab experiment projects and tutorial classes and promote discovery learning through Web 2.0.		√	√	√	13 hours

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%						
Test	√	√			20%	20% marks, 1.5 hours.
Labs & Discovery Learning			√	√	30%	30% marks; students' performance in on hand lab experiments and group presentation.
Examination: 50% (duration: 2 hours)						50% marks, 2 hours.
					100%	

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

5. Assessment Rubrics

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

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
Test	Apply the concepts of nano-manufacturing to solve problems and answer the questions correctly and properly.	High	Significant	Moderate	Basic	Not even reaching marginal levels
Labs & Discovery Learning	Ability to explain the methodology and procedure, analyse the experimental data, discuss the experimental findings, and demonstrate discovery during learning.	High	Significant	Moderate	Basic	Not even reaching marginal levels
Examination	Describe the fundamental concepts of nano-manufacturing, and apply them to solve the problems and answer the questions correctly and properly.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
Test	Apply the concepts of nano-manufacturing to solve problems and answer the questions correctly and properly.	High	Significant	Moderate	Not even reaching marginal levels
Labs & Discovery Learning	Ability to explain the methodology and procedure, analyse the experimental data, discuss the experimental findings, and demonstrate discovery during learning.	High	Significant	Moderate	Not even reaching marginal levels
Examination	Describe the fundamental concepts of nano-manufacturing, and apply them to solve the problems and answer the questions correctly and properly.	High	Significant	Moderate	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.)

Background to nanotechnology and nanomanufacturing, top-down and bottom-up approaches, self-assembly, soft and nanoimprint lithography technologies, reliability and defect control, leaving the laboratory: regulatory and societal issues confronting nanotechnology commercialization.

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.)

Editors: Zhaoying Zhou, Zhonglin Wang, Liwei Lin (Eds.), "Microsystems and Nanotechnology", Springer, 2012, ISBN: 978-3-642-18293-8.

Online Resources

Online learning material is provided via university computer network.