City University of Hong Kong
Course Syllabus

offered by Department of Electronic Engineering
with effect from Semester B in 2018/2019

Part I Course Overview

Course Title:	Nanotechnology for Devices and Microsystems
Course Code:	EE6615
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P6
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)*	Nil

Part II Course Details

1. Abstract

The aim of the course is to provide students with theoretical knowledge and analytical skills necessary for an in-depth understanding of the chemistry and physics of nanofabrication technologies used in microelectronics and microsystems. Highlighted topics include patterning, interconnects, and packaging technology for nanostructures, devices, and microsystems.

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.	Explain the principles of nanofabrication technology.		✓	✓	
2.	Apply nanotechnology to nanostructures, devices and microsystems fabrication.		✓	✓	
3.	Design nanotechnology for specific nanostructures, devices and microsystems.		✓	✓	✓
4.	Recognize limits of nanotechnology for different applications.		✓	✓	
5.	Perform independent studies to identify future developments of nanotechnology in nanostructures, nanodevices, and microsystems.		✓	✓	✓
		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	5		
Lecture	Knowledge of the general concepts in nanotechnology and its applications.	✓	✓	✓	✓			3 hrs/wk for 8 weeks
Laboratory	Hands on experience in cleanroom to practice nanotechnology.		✓	✓	✓			3 hrs/wk for 3 weeks
Project	Research selected nanotechnology topics and provide independent evaluations.	✓	✓	✓	✓	✓		3 hrs/wk for 2 weeks

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	5			
Continuous Assessment: 60%								
Quiz	✓	✓					20%	
At least 3 assignments (project report, presentation, laboratory work and report etc.)	✓	✓	✓	✓	✓		40%	
Examination: 40% (duration: 2hrs)								
							100%	

Remark:

To pass the course, students are required to achieve at least 30% in course work, 30% in the examination, and 75% laboratory attendance rate.

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. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level

6. Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1, 2, 3, 4	Students are required to apply the fundamental theoretical knowledge and analytical skills for an in-depth understanding of nanotechnology for nanostructures, nanodevices and microsystems. The students have many opportunities to formulate and solve problems using the learnt knowledge and skills.
2, 3, 4, 5	Students are required to complete an independent research study on new developments of nanotechnology in nanodevices and microsystems.
6	Students are required to give an oral presentation of their independent research studies.

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

1. Keyword Syllabus

- Overview of nanotechnology
- Clean rooms facilities for nanofabrication
- Lithography technology for high-resolution patterning and mass production
- Dry and wet etching technologies for nanostructures, nanodevices, and microsystems
- Introduction of dopants to control conductivity and form shallow junctions
- Electrical contact formation and multiple level interconnects
- Nanophotonic devices for optical communications and biosensing applications
- Micro-Electro-Mechanical Systems (MEMS) and their applications
- Nanoimprint technology for three dimensional nanostructures and nanodevices
- Packing technology for nanodevices and microsystems

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.	Course notes provided by the instructor

2.2 Additional Readings

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

1.	Silicon VLSI Technology - Fundamentals, Practice and Modeling, Plummer, Deal, and Griffin (Prentice Hall, 2000).
2.	Fabrication Engineering at the Micro- and Nanoscale, Stephen A. Campbell (Oxford University Press, 2008).
3.	Fundamentals of Microfabrication and Nanotechnology, Marc J. Madou, (CRC Press, 3rd Edition, 2011).