City University of Hong Kong
Course Syllabus

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

Part I Course Overview

Course Title:	Packaging for Nanoelectronics
Course Code:	SYE6206
Course Duration:	One Semester
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)*	ADSE6206 Packaging for Nanoelectronics (offered until 2023/24)
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

Packaging for Nanoelectronics is an advanced course that focuses on specialized packaging technologies for nanoelectronic devices. It covers the challenges, requirements, and advancements in nanoscale packaging, including system integration, interconnects, and management. The course explores various topics such as design considerations, advanced materials, and interconnect technologies. It also delves into the reliability aspects of nanoelectronic packaging, addressing concerns such as electromigration, thermal cycling, and mechanical stress. Real-world case studies and examples are incorporated to provide practical insights and enhance understanding. The course highlights emerging trends and future directions in nanoelectronics packaging. By the end of the course, students will possess the skills necessary to design, analyze, and optimize packaging solutions for nanoelectronic devices, considering the unique challenges and requirements at the nanoscale.

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.	Understand the fundamental principles and challenges associated with packaging for nanoelectronics, including the impact of nanoscale devices on packaging requirements and limitations.	25%	✓	✓	
2.	Develop proficiency in designing and optimizing packaging solutions for nanoelectronic devices.	25%	✓	✓	
3.	Analyze and evaluate the reliability aspects of nanoelectronic packaging, including the identification and mitigation of failure mechanisms.	25%	✓	✓	
4.	Apply advanced packaging materials and interconnect technologies suitable for nanoscale devices, including nanowires, nanotubes, and 2D materials, to ensure reliable and efficient operation of nanoelectronic systems.	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	Lectures on the topics of the keyword syllabus.	✓	✓	✓	✓	3 hours/week
Mini project	Team-based mini project	✓	✓	✓	✓	3 hours/semester
Office Hour	Discussions of course materials	✓	✓	✓	✓	1 hour/week

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 %						
Mid-term exam	✓	✓	✓	✓	30%	
Mini project report	✓	✓	✓	✓	20%	
Examination: 50 % (duration: 2 hours , if applicable)						
					100%	

For a student to pass the course, at least 30% of the maximum mark for the 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)
1. Mid-term exam	Understand nanoelectronics packaging principles, challenges, and limitations. Develop proficiency in designing optimized solutions, considering signal integrity, power, miniaturization, and thermal management.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Mini project	Apply the knowledge acquired to address practical issues through teamwork and oral presentation.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Final exam	Understand nanoelectronics packaging principles, challenges, and limitations. Design optimized solutions considering signal integrity, power, miniaturization, thermal management. Analyze reliability aspects and apply advanced materials/ interconnects for robust nanoelectronic packages.	High	Significant	Moderate	Basic	Not even reaching marginal levels

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

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Mid-term exam	Understand nanoelectronics packaging principles, challenges, and limitations. Develop proficiency in designing optimized solutions, considering signal integrity, power, miniaturization, and thermal management.	High	Significant	Moderate/Basic	Not even reaching marginal levels
2. Mini project	Apply the knowledge acquired to address practical issues through teamwork and oral presentation.	High	Significant	Moderate/Basic	Not even reaching marginal levels
3. Final exam	Understand nanoelectronics packaging principles, challenges, and limitations. Design optimized solutions considering signal integrity, power, miniaturization, thermal management. Analyze reliability aspects and apply advanced materials/ interconnects for robust nanoelectronic packages.	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.)

- Packaging for Nanoelectronics
- Specialized technologies for nanoelectronic devices
- Challenges, requirements, and advancements in nanoscale packaging
- System integration, interconnects, and thermal management
- Design considerations, advanced materials, and interconnect technologies
- Real-world case studies and examples for practical insights
- Emerging trends and future directions in nanoelectronics packaging

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.	"Advanced Packaging and Manufacturing Technology for Micro- and Nanoelectronics" edited by Feng Xue and S.J. Chua, published by CRC Press, 2020.

2.2 Additional Readings

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

NIL