City University of Hong Kong
Course Syllabus

offered by Department of Systems Engineering
with effect from Semester A 2023 / 24

Part I Course Overview

Course Title:	3D IC Stacking and Advanced Packaging Technology
Course Code:	ADSE6201
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)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

3D IC Stacking Technology, describes a technology that promises a revolution in SiP (system-in-package) formation—accelerating the performance of electronic systems in a "more than Moore" fashion. This innovative technology presents complexities as well as great opportunities to the electronic systems industry. This course aims at: (1) to equip students with fundamental knowledge and concepts on 3D IC stacking technology, and to enable the students to apply such knowledge in future careers in both industry and universities; (2) to enable students to understand the stacking of integrated circuits interconnected by through silicon vias (TSVs); and (3) to introduce students to promising and emerging applications of innovative process technologies and new design methodologies to fully exploit the capability of the 3D integrated circuit.

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.	Fundamental knowledge and concepts on advanced packaging technology	25%	✓	✓	
2.	Process integration for 3DIC technology	25%	✓	✓	
3.	Emerging technologies and design methodologies for 3DIC applications	25%		✓	✓
4	Assembly and test aspects of 3DIC technology	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 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	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)						
Examination	✓	✓	✓	✓	50%	
					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 in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Mid-term exam	Understand some of the techniques, skills, and modern trends for advanced packaging technology.	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	Apply the knowledge of mathematics, science and engineering to 3D IC stacking and advanced packaging technology.	High	Significant	Moderate/Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Mid-term exam	Understand some of the techniques, skills, and modern trends for advanced packaging technology.	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	Basic	Not even reaching marginal levels
3. Final exam	Apply the knowledge of mathematics, science and engineering to 3D IC stacking and advanced packaging technology.	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.)

- Introduction to high-density through silicon stacking technology
- Practical design eco-system for heterogeneous 3D IC products
- Process integration for TSV manufacturing
- High-aspect-ratio silicon etch for TSV
- Dielectric deposition for through silicon vias
- Barrier and seed deposition
- Copper electrodeposition for TSV
- Chemical mechanical polishing for TSV applications
- Temporary and permanent bonding
- Assembly and test aspects of TSV technology

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.	3D IC Stacking Technology, McGraw-Hill, 2011
2.	Semiconductor Advanced Packaging, Springer, 2021
3.	Materials for Advanced Packaging, Springer, 2009

2.2 Additional Readings

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

NIL