

SYE6201: 3D IC STACKING AND ADVANCED PACKAGING TECHNOLOGY

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

3D IC Stacking and Advanced Packaging Technology

Subject Code

SYE - Systems Engineering

Course Number

6201

Academic Unit

Systems Engineering (SYE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

ADSE6201 3D IC Stacking and Advanced Packaging Technology (offered until 2023/24)

Exclusive Courses

Nil

Part II Course Details

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.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Fundamental knowledge and concepts on advanced packaging technology	25	x	x	
2	Process integration for 3DIC technology	25	x	x	
3	Emerging technologies and design methodologies for 3DIC applications	25		x	x
4	Assembly and test aspects of 3DIC technology	25	x	x	

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.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures on the topics of the keyword syllabus.	1, 2, 3, 4	3 hours/week
2	Mini project	Team-based mini project	1, 2, 3, 4	3 hours/semester

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mid-term exam	1, 2, 3, 4	30	-	No
2	Mini project report	1, 2, 3, 4	20	-	Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Assessment Rubrics (AR)

Assessment Task

Mid-term exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Understand some of the techniques, skills, and modern trends for advanced packaging technology.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Mini project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Apply the knowledge acquired to address practical issues through teamwork and oral presentation.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate/Basic

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Final exam (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Apply the knowledge of mathematics, science and engineering to 3D IC stacking and advanced packaging technology.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Mid-term exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Understand some of the techniques, skills, and modern trends for advanced packaging technology.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Mini project (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

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Part III Other Information**Keyword Syllabus**

- 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 electroplating for TSV
- Chemical mechanical polishing for TSV applications
- Temporary and permanent bonding
- Assembly and test aspects of TSV technology

Reading List**Compulsory Readings**

Title	
1	3D IC Stacking Technology, McGraw-Hill, 2011
2	Semiconductor Advanced Packaging Springer, 2021
3	Materials for Advanced Packaging, Springer, 2009

Additional Readings

Title	
1	NIL