

# SYE4002: FUNDAMENTALS OF ADVANCED PACKAGING

## New Syllabus Proposal

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### Effective Term

Semester B 2024/25

## Part I Course Overview

### Course Title

Fundamentals of Advanced Packaging

### Subject Code

SYE - Systems Engineering

### Course Number

4002

### Academic Unit

Systems Engineering (SYE)

### College/School

College of Engineering (EG)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

"Fundamentals of Advanced Packaging" is a comprehensive course designed to equip students with the essential knowledge and skills in the field of advanced packaging technology. As electronic devices continue to shrink in size while increasing in functionality, advanced packaging plays a crucial role in enabling this trend. This course offers a deep insight into the principles, techniques, and technologies involved in advanced packaging, covering topics such as 3D integration, heterogeneous integration, system-in-package (SiP), and advanced interconnection methods. Students will learn about the latest advancements in packaging materials, processes, and designs, as well as the challenges and opportunities in this rapidly evolving field. Through a combination of lectures and case studies, students will develop a solid understanding of advanced packaging concepts and their applications in various industries, including consumer electronics, telecommunications, automotive, and healthcare. Whether you're a student pursuing a career in electronics engineering or a professional looking to expand your expertise, this course will provide you with the foundation needed to excel in the dynamic world of advanced packaging.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Have an overview understanding of the technologies in advanced packaging structures.	20	x	x	
2	Can analyze the main reliability challenges in electronic packaging structures.	30		x	x
3	Can get an overview of packaging technology trends in high-tech companies.	20	x	x	
4	Have a basic knowledge of the latest advancements in packaging materials, processes, and designs.	30		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	Lectures	The lectures will follow the chapters in the textbook.  Presentation and Tests: students will give presentations on topics related to the course. Tests will also be conducted.	1, 2, 3, 4	3 hours/week

**Assessment Tasks / Activities (ATs)**

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Presentation	1, 3	30	
2	#Assignments (min.:3)	1, 2, 4	10	

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

2

**Additional Information for ATs**

To pass the course, students are required to achieve at least 30% in continuous assessment and 30% in the examination.  
# may include homework, tutorial exercise, project/mini-project, presentation.

**Assessment Rubrics (AR)****Assessment Task**

Continuous Assessment

**Criterion**

Achievements in CILOs

**Excellent (A+, A, A-)**

High (overall score more than 80%)

**Good (B+, B, B-)**

Significant (overall score more than 60%)

**Fair (C+, C, C-)**

Moderate (overall score more than 40%)

**Marginal (D)**

Basic (overall score more than 30%)

**Failure (F)**

Not even reaching marginal levels (overall score less than 30%)

**Assessment Task**

Examination

**Criterion**

Achievements in CILOs

**Excellent (A+, A, A-)**

High (score more than 80%)

**Good (B+, B, B-)**

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**Marginal (D)**

Basic (score more than 30%)

**Failure (F)**Not even reaching marginal levels (score less than 30%)

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**Part III Other Information****Keyword Syllabus**

- Role of packaging in microelectronics
- Advanced packaging technologies, covering topics such as 3D integration, heterogeneous integration, system-in-package (SiP), and advanced interconnection methods.
- Solid-Liquid Interfacial Diffusion Reactions (SLID) between Copper and Solder
- Essence of Integrated Circuits and Packaging Design
- Performance, Power, Thermal and Reliability
- Packaging technology trends in high-tech companies
- Irreversible Processes in Electronic Packaging Technology
- Electromigration
- Thermomigration
- Stress-Migration
- Failure Analysis
- Artificial Intelligence on Electronic Packaging Reliability

**Reading List****Compulsory Readings**

Title	
1	Fundamentals of microsystems packaging, McGraw Hill, Rao R. Tummala
2	Electronic thin-film reliability, Cambridge, King-Ning Tu

**Additional Readings**

	<b>Title</b>
1	Nil