

SYE6202: SEMICONDUCTOR PROCESS EQUIPMENT AND MATERIALS

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Semiconductor Process Equipment and Materials

Subject Code

SYE - Systems Engineering

Course Number

6202

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

ADSE6202 Semiconductor Process Equipment and Materials (offered until 2023/24)

Exclusive Courses

Nil

Part II Course Details

Abstract

Learn the use and science fundamentals behind the materials critical to microelectronic devices and device packaging, such as silicon, germanium, alumina, silver, copper and polymers. This course includes conventional and state-of-the-art fabrication techniques. Highlighted within the course will be the processing unit operations in semiconductor manufacturing (e.g., PVD, CVD, CMP Electroplating, Etching, Photolithography Ion Implantation), testing/assembly of these materials as semiconductor devices, and the protective packaging that permits these microdevices to be interconnected within larger electronic systems. At course completion, students will possess an understanding of each processing unit in semiconductor manufacturing, packaging and assembly, and materials integration of microelectronic devices.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Fundamentals of the materials critical to microelectronic devices and device packaging	25	x	x	
2	Processing unit operations in semiconductor manufacturing	25	x	x	
3	Semiconductor fabrication equipment	25	x	x	
4	Testing/assembly in semiconductor devices	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	Lab	Lab session	1, 2, 3, 4	3 hours/semester
3	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	15	-	No
2	Lab report	1, 2, 3, 4	15	-	No
3	Mini project report	1, 2, 3, 4	20	-	No

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 semiconductor process equipment and materials.

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

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

Criterion

Gain hands-on experience with the semiconductor microfabrication processes equipment through laboratory experiments

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

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 semiconductor process equipment and materials.

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 semiconductor process equipment and materials.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

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

Failure

(F) Not even reaching marginal levels

Assessment Task

Lab report (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Gain hands-on experience with the semiconductor microfabrication processes equipment through laboratory experiments

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

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

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

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

Failure

(F) Not even reaching marginal levels

Assessment Task

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

Criterion

Apply the knowledge of mathematics, science and engineering to semiconductor process equipment and materials.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

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

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

- Overview of wafer fabrication and packaging
- Key materials and chemicals in microelectronic devices and packaging
- Semiconductor unit process and equipment
- Materials and equipment in testing/assembly
- Productivity and process yields
- Process and equipment diagnosis

Reading List**Compulsory Readings**

Title	
1	Fundamentals of Semiconductor Manufacturing and Process Control, Wiley-Interscience, 2006
2	Semiconductor Manufacturing Handbook, McGraw-Hill, 2005
3	Microchip Fabrication: A Practical Guide to Semiconductor Processing, McGraw-Hill, 2014

Additional Readings

Title	
1	NIL