

**City University of Hong Kong  
Course Syllabus**

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

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**Part I Course Overview**

<b>Course Title:</b>	Semiconductor Process Equipment and Materials
<b>Course Code:</b>	SYE6202
<b>Course Duration:</b>	One Semester
<b>Credit Units:</b>	3
<b>Level:</b>	P6
<b>Medium of Instruction:</b>	English
<b>Medium of Assessment:</b>	English
<b>Prerequisites:</b> <i>(Course Code and Title)</i>	Nil
<b>Precursors:</b> <i>(Course Code and Title)</i>	Nil
<b>Equivalent Courses:</b> <i>(Course Code and Title)</i>	ADSE6202 Semiconductor Process Equipment and Materials (offered until 2023/24)
<b>Exclusive Courses:</b> <i>(Course Code and Title)</i>	Nil

## Part II Course Details

### 1. 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.

### 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.	Fundamentals of the materials critical to microelectronic devices and device packaging	25%	✓	✓	
2.	Processing unit operations in semiconductor manufacturing	25%	✓	✓	
3.	Semiconductor fabrication equipment	25%	✓	✓	
4.	Testing/assembly in semiconductor devices	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
Lab	Lab session	✓	✓	✓	✓	3 hours/semester
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: <u>50</u> %						
Mid-term exam	✓	✓	✓	✓	15%	
Lab report	✓	✓	✓	✓	15%	
Mini project report	✓	✓	✓	✓	20%	
Examination: <u>50</u> % (duration: <u>2 hours</u> , 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 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 some of the techniques, skills, and modern trends for semiconductor process equipment and materials.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Lab report	Gain hands-on experience with the semiconductor microfabrication processes equipment through laboratory experiments	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Mini project	Apply the knowledge acquired to address practical issues through teamwork and oral presentation.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Final exam	Apply the knowledge of mathematics, science and engineering to semiconductor process equipment and materials.	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 some of the techniques, skills, and modern trends for semiconductor process equipment and materials.	High	Significant	Moderate/Basic	Not even reaching marginal levels
2. Lab report	Gain hands-on experience with the semiconductor microfabrication processes equipment through laboratory experiments	High	Significant	Moderate/Basic	Not even reaching marginal levels
3. Mini project	Apply the knowledge acquired to address practical issues through teamwork and oral presentation.	High	Significant	Moderate/Basic	Not even reaching marginal levels
4. Final exam	Apply the knowledge of mathematics, science and engineering to semiconductor process equipment and materials.	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.)*

- 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

**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.	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

**2.2 Additional Readings**

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

*NIL*