**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

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|---|---|
| **Course Title:** | Semiconductor Manufacturing and Management |
| **Course Code**: | SYE6109 |
| **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)* | ADSE6109 Semiconductor Manufacturing and Management (offered until 2023/24) |
| **Exclusive Courses**: *(Course Code and Title)* | Nil |

## Part II Course Details

### 1. Abstract

In the era of big data, customers have a growing demand for higher performance consumer electronic products. The continual advancement in semiconductor manufacturing is the key to ensuring the capacity for electronic information processing and data storage. The course aims to provide students with a broad overview of modern semiconductor manufacturing and management in consumer electronic products. This course is suitable for students from different backgrounds. We will cover basic operation principles for semiconductor devices and technological details for the fabrication processes of semiconductor devices. Based on these discussions, the management in the semiconductor business will be discussed in the case studies of the renewal and transformation at big semiconductor companies, such as Samsung, TSMC, and Intel.

### 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. | Have a clear understanding of the operation principles for semiconductor integrated circuits. | 20% | | ✓ | ✓ |
| 2. | Can elaborate the main technologies in semiconductor manufacturing process. | 50% | | ✓ | ✓ |
| 3. | Can get an overview of the renewal and transformation management in semiconductor companies. | 30% | ✓ | | ✓ |
| | | 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 | |
| Lectures | The lectures will follow the chapters in the textbook | ✓ | ✓ | ✓ | 3hrs/wk (for 10 wks) |
| Presentation and Tests | Students will give presentations on topics related to the course. Tests will also be conducted. | ✓ | ✓ | ✓ | 3hrs/wk (for 3 wks) |

## 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 | | |
| Continuous Assessment: 40 % | | | | | |
| Presentation | ✓ | ✓ | ✓ | 30 % | |
| Assignments (min.:3)<br>-May include homework, tutorial exercise, project/mini-project, presentation. | ✓ | ✓ | ✓ | 10 % | |
| Examination: 60 % (duration: 2 hrs , if applicable) | | | | | |
| Examination | ✓ | ✓ | ✓ | 60 % | |
| | | | | 100% | |

To pass the course, students are required to achieve at least 30% in continuous assessment and 30% in the examination.

## 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. Continuous Assessment | Achievements in CILOs | High | Significant | Moderate | Basic | Not even reaching marginal levels |
| 2. Examination | Achievements in CILOs | 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. Continuous Assessment | Achievements in CILOs | High | Moderate | Basic | Not even reaching marginal level |
| 2. Examination | Achievements in CILOs | High | Moderate | Basic | Not even reaching marginal level |

**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.)*

- Semiconductor materials
- Operation of semiconductor devices
- Process Technology
- Additive Processes, including thermal oxidation of silicon, Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD), and electrochemical deposition.
- Lithography
- Subtractive Processes, including wet etching and dry etching.
- Processing of Contacts and Interconnects
- Assembly and packaging technology
- Dynamic techno-management capability
- Renewal and transformation of semiconductor companies, case studies including TSMC, Samsung, and Intel.

**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.)*

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|---|---|
| 1. | Guide to Semiconductor Engineering, Jerzy Ruzyllo, 2020. |
| 2. | Dynamic Techno-Management Capability (The case of Samsung semiconductor sector in Korea), Youngrak Choi, 1996. |

**2.2 Additional Readings**

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

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|---|---|
| 1. | Corporate Comeback (The story of Renewal and Transformation at National Semiconductor), Robert H. Miles, 1996. |