City University of Hong Kong
Course Syllabus

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

Part I Course Overview

Course Title:	Semiconductor Thin Film Engineering
Course Code:	SYE6205
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)*	ADSE6205 Semiconductor Thin Film Engineering (offered until 2023/24)
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

Semiconductor Thin Film Engineering is an advanced course that explores principles, techniques, and applications of semiconductor thin films. It covers deposition methods (e.g., physical vapor deposition, chemical vapor deposition, atomic layer deposition, molecular beam epitaxy), characterization techniques, and properties and applications of thin films in devices like and integrated circuits and transistors as well as displays and solar cells. This course includes advanced topics like nanoscale thin film engineering and integration into complex device structures. It also addresses challenges such as defects, reliability, and process optimization. By course completion, students will have a strong foundation in semiconductor thin film engineering, enabling them to understand thin film technology in semiconductor applications.

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.	Understand the fundamental principles and concepts of semiconductor thin film engineering, including the deposition methods, materials, and characterization techniques used in the field.	25%	✓	✓	
2.	Develop proficiency in the selection and application of appropriate thin film deposition techniques for specific semiconductor applications, considering factors such as material compatibility, film quality, and device requirements.	25%	✓	✓	
3.	Analyse and evaluate the properties and performance of semiconductor thin films through advanced characterization techniques, including surface and interface analysis, structural analysis, and electrical/optical characterization.	25%	✓	✓	
4.	Apply the knowledge gained to solve practical engineering problems related to thin film engineering, including addressing challenges such as defects, reliability issues, and process optimization, and integrating thin films into complex device structures.	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
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: _30_ %						
Mid-term exam	✓	✓	✓	✓	30%	
Examination: _70__ % (duration: 2 hours, if applicable)						
					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	Learn semiconductor thin film engineering principles, deposition methods, and characterization techniques. Develop proficiency in selecting and applying deposition techniques for specific semiconductor applications.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Final exam	Analyze semiconductor thin films using advanced characterization techniques. Apply knowledge to solve engineering problems, address challenges, and integrate thin films into complex devices.	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	Learn semiconductor thin film engineering principles, deposition methods, and characterization techniques. Develop proficiency in selecting and applying deposition techniques for specific semiconductor applications.	High	Significant	Moderate/Basic	Not even reaching marginal levels
2. Final exam	Analyze semiconductor thin films using advanced characterization techniques. Apply knowledge to solve engineering problems, address challenges, and integrate thin films into complex devices.	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.)

- Principles, techniques, applications
- Physical vapor deposition (PVD)
- Chemical vapor deposition (CVD)
- Atomic layer deposition (ALD)
- Molecular beam epitaxy
- Electroplating deposition (ECD)
- Chemical mechanical polishing (CMP)
- Characterization techniques: film thickness, structural properties, electrical/optical characteristics
- Challenges: defects, reliability, process optimization

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.	"Thin-Film Deposition: Principles and Practice" by Donald Smith (3rd edition, published in 2019)
2.	"Handbook of Thin Film Deposition Processes and Techniques" edited by Krishna Seshan (2nd edition, published in 2018)

2.2 Additional Readings

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

NIL