City University of Hong Kong
Course Syllabus

offered by Department of Systems Engineering
with effect from Semester A 2023 / 24

Part I   Course Overview

Course Title: VLSI/ULSI process integration

Course Code: ADSE6204

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) Nil

Exclusive Courses:
(Course Code and Title) Nil

Part II   Course Details

1.   **Abstract**

The aim of this course is to provide students with a basic understanding of very large-scale integration (VLSI), the process of creating an integrated circuit (IC) by combining millions or billions of MOS transistors onto a single chip. An understanding of modern logic design is crucial to chip manufacturing, as almost all digital systems today are based on VLSI chips. The course will provide an overview of the MOS transistors and IC fabrication and develop abstractions to create and reason about complex digital systems. This course serves as an introduction to back-end VLSI design fundamentals, as well as various computer-aided design (CAD) tools and methodologies.

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.	Understanding of MOS transistors	25%	✓	✓	
2.	Understanding of micro-fabrication processes	25%	✓	✓	
3.	Basic VLSI design	25%	✓	✓	
4	Testing, reliability, power and performance	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 self-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. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	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)						
Examination	✓	✓	✓	✓	70%	
					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 in Semester A 2022/23 and thereafter

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 VLSI technology.	High	Significant	Moderate/Basic	Not even reaching marginal levels
2. Final exam	Apply the knowledge of mathematics, science and engineering to VLSI technology.	High	Significant	Moderate/Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

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 VLSI technology.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Final exam	Apply the knowledge of mathematics, science and engineering to VLSI technology.	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 VLSI systems
   - MOS transistor theory
   - Layout design rules
   - IC fabrication
   - MEMs and Memory system
   - Testing, reliability, power and performance

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 Modern VLSI Devices, Cambridge University Press, 2013
2.	VLSI Fabrication Principles: Silicon and Gallium Arsenide, Wiley, 2008
3.	VLSI Technology, McGraw Hill Education, 2017

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

   NIL