City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester A 2022/2023

Part I Course Overview

Course Title:	Discrete Time Control Systems
Course Code:	EE6430
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	EE3114 Systems and Control; or equivalent
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aims to provide students with knowledge of modern control system, covering the topics of state space control design, online identification techniques, and real time control implementation.

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.	Apply state space control design and analyse the performance of the controlled system.		✓	✓	
2.	Apply online identification techniques to obtain the system model of a plant.		✓	✓	
3.	Construct real time control system.		✓	✓	✓
		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				
Lecture	Key concepts and methodology of discrete-time control are described and illustrated. Other activities during lectures include problem Q&A, in-class exercises	✓	✓	✓				3 hrs/wk for 9 weeks
Mini-project	Student is to apply the knowledge learnt in the course to design and implement a discrete-time controller for a system	✓	✓	✓				3 hrs/wk for 4 weeks

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: 50%								
At least 3 assignments (assignments, mini project etc.)	✓	✓	✓				35%	
Test	✓	✓	✓				15%	
Examination: 50% (duration: 2hrs , if applicable)								
							100%	

Remark:

To pass the course, students are required to achieve at least 30% in course work 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 in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B,)	Marginal (B-, C+, C)	Failure (F)
1. Examination	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level

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. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level

6. Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1,2,3,4,5	This course aims to provide students with knowledge in the major areas of discrete time control systems. Upon completion of this course, students will gain general knowledge of control design for real time control engineering.
2,3,4,5	Students are required to complete an assignment designed to gain practical hands-on experience on how real time control are carried out.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Fundamentals
Introduction to basic control engineering concept, discrete time fundamentals, D/A and A/D designs, sampling theorem

Control methodology
Classical control design, state space feedback control, observer design, optimal control, adaptive control

Real time Implementation
Real time UD identification, real time control

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.	Katsuhiko Ogata, Discrete time control systems, Prentice Hall.

2.2 Additional Readings

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

1.	R.G. Jacquot, Modern digital control system, CRC Press.
2.	P. Ioannou and B. Fidan, Adaptive Control Tutorial, SIAM.
3.	K.J. Astrom and B. Wittenmark, Adaptive control, Addison Wesley.