THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY
Approval of Undergraduate Course

Section 1: Academic Administration [1]

1.1 Catalog

a) Course to be effective from: Academic Year 2020-21 Term Spring

b) Department Code[3]: ECE Subject Area[3]: *ELEC* Course Number [4]: 4210

Previous Course Code[5]: ELEC4010G

c) Full Title[6] *(max. 100 characters)*: Control System Design

d) Abbreviated Title[7] *(max. 30 characters)*: Control System Design

e) Course Credits[8]: (X) Fixed: 3 ( ) Range: From _____ To _____

f) Catalog Description[9] *(word limit = 150)*:

In the lectures, the following topics will be covered: time-domain and frequency-domain system modeling and analysis, optimal control, robust control, computer aided control designs, digital control. In the experiments, the students will be asked to design and implement controllers for a magnetic suspension system, an inverted pendulum system, and a tower crane system.

g) Grading Type[10]: (X) Letter Grades ( ) Distinction/Credit/Pass/Fail ( ) Pass/ Fail ( ) Distinction/Pass/Fail [ ] Others *(please specify)*: _____

h) [x] Prerequisites[11]:

Course Code / Public Exam	Course Title / Exam Subject and Level / Grade attained
ELEC3200 or	System Modeling, Analysis and Control
MECH3610	Control Principles

i) [ ] Corequisites[12]:

Course Code	Course Title

j) [ ] Exclusions[13]:

Course Code / Public Exam	Course Title / Exam Subject and Level / Grade attained

k) [ ] Co-listing[14]: [ ] Multi-coding[14]:

Course Code	Course Title

l) Other Enrollment Restrictions[15] (X) No ( ) Yes

[ ] Instructor's approval required

[ ] Restricted to specified student group(s) _____

[ ]

(please specify, e.g. year and program of study): _____

Others *(please specify):* _____

m) Medium of Instruction/Materials[16]: (X) English ( ) Others, (Pls specify and provide a justification in Section 1.3): _____

n) Allow course repetition for credit[17]: (X) No ( ) Yes

1.2 *Contribution of course to Programs of Study [Check all appropriate boxes below]*

[x] Major

Program of Study	As		
BEng(ELEC)	[ ] Required Course	[x] Elective	[ ] Prerequisite

[ ] Minor

Program of Study	As		
	[ ] Required Course	[ ] Elective	[ ] Prerequisite

[ ] Common Core

[ ] Others (pls specify):

Program of Study	As		
	[ ] Required Course	[ ] Elective	[ ] Prerequisite

1.3 *Rationale for Introducing this course and other relevant information [18]*

Control systems are an integral part of manufacturing industry. The new development in a smart society, including robotics and autonomous vehicle technology, calls for more advanced control systems. Control techniques are now even used to address social problems. There is a timely demand for this course.

This course has been offered for quite a few times in UST. It uses a textbook written by the course developer and uses some lab facility developed by the course developer. It has been well received by the students.

Section 2A: Learning Outcomes and Alignment *(for courses not proposed to be Common Core Courses)*

2.1 *Key Course Intended Learning Outcomes (Should not normally exceed six or eight outcomes)*

Upon completion of this course, students are expected to be able to do the following:

	Course ILOs	**Nature of the learning outcomes** *(A - Knowledge/Content Related; B - Academic Skills/Competencies; C - Others)*
1	Have an in-depth understanding of time-domain and frequency-domain methods as well as their relationships in dynamic system modeling, analysis and control.	A
2	Use several techniques for control system design.	B
3	Understand further the importance of feedback and its limitations.	A
4	Skillfully use CAD tools (such as MATLAB and SIMULINK) in control system modeling, analysis and control.	B
5	Equip themselves with experience in controlling real physical systems.	A
6		
7		
8		

2.2 *Contribution of Learning Outcomes to Programs of Study identified in Section 1.2*

(Please also complete Section 4.1)

	Program of study 1: _____ELEC_____ **Program ILOs**	**To be achieved through these course ILOs** *(Write CILO-1, CILO-2, etc.)*
1	An ability to apply knowledge of mathematics, science and Electronic and Computer Engineering.	CILO-1,CILO-2,CILO-3
2	An ability to design and conduct experiments, as well as to analyze and interpret data.	CILO-4, CILO-5
3	An ability to design efficient and economical Electronic and Computer Engineering systems, components or process subject to practical constraints.	CILO-1, CILO-2, CILO-3,CILO-5
4	An ability to function in a multi-disciplinary environment through teamwork.	
5	An ability to identify, formulate and solve Electronic and Computer Engineering problems.	
6	An ability to understand professional practices and ethical responsibilities.	
7	An ability to communicate effectively.	
8	An ability to understand contemporary global, regional, economic, environmental, and social issues, and the corresponding role and the impact of Electronic and Computer engineers.	
9	An ability to recognize the need for, and to engage in life-long learning.	
10	An ability to use current techniques, skills and engineering tools necessary for solving Electronic and Computer Engineering problems.	CILO-4, CILO-5
11	An ability to use the computer/IT tools relevant to the Electronic and Computer Engineering along with an understanding of their processes and limitations.	CILO-4, CILO-5

Section 2B: Additional Information[2] *(for courses not proposed to be Common Core Courses)*

2.3 *Planned Teaching & Learning Arrangement*

	Teaching & Learning Arrangement	Weekly Scheduled Hours/ Estimated Weekly Learning Hours	Indicate which course ILOs this activity serves to achieve *(Write CILO-1, CILO-2, etc.)*	Additional Information *(optional)*
Face-to face activities	[x] Lecture*	**3**	**CILO-1, CILO-2, CILO-3**	
	[ ] Tutorial*			
	[ ] Seminar/Small-class*			
	[x] Laboratory*	**1**	**CILO-4, CILO-5**	
	*Does the above scheduled component(s) involve structured active learning activities? [19] (X) No ( ) Yes *If yes, please specify for each scheduled component, the percentage and the type of active learning involved in the "Additional Information" column.*			
	[ ] Others (e.g. fieldtrip, visit, etc.), *pls specify:* _____			
Online activities	[ ] Online lecture videos			
	[ ] Other online learning tasks, *pls specify:* _____			
	The total learning hours of the course# is equivalent to _____120____ hours [8] *# including both scheduled instructional hours and hours for self-study activities & assessment*			

- *For course adopting a pedagogic approach other than lecture, tutorial and laboratory, please indicate the pedagogy used:*

( ) Blended learning [20] ( ) Pure online delivery [21]

( ) Experiential learning [22] ( ) Others, *pls specify:*_____

2.4 *Planned Assessment Weightings*

Assessment Task	Proportion of Final Grade (%)	Indicate which course ILOs this task is to assess *(Write CILO-1, CILO-2, etc.)*	Additional Information *(optional)*
[ ] In-class test			
[ ] Mid-term test			
[x] Final exam	**40%**	**CILO-1, CILO-2, CILO-3**	
[x] Written assignment	**30%**	**CILO-1, CILO-2, CILO-3, CILO-4**	
[ ] Project report			
[ ] Presentation			
[ ] Learning portfolio			
[ ] Course participation			
[ ] Peer evaluation			
[x] Others (e.g. proctored online exam, etc.), *pls specify:* _____*Lab*_____	**30%**	**CILO- 4, CILO-5**	

2.5 *Course Duration*

(X) 1 term ◯ 2 terms ◯ Others, *pls specify:* _____

2.6 *Planned Frequency of Offerings* *[Check all appropriate boxes]:*

☐ Every Fall ☐ Every Winter

☒ Every Spring ☐ Every Summer

☐ No fixed pattern

☐ Other *(pls specify):* _____

2.7 *Course outline attached* ◯ No ◉ Yes

- **Internationalization:**

Internationalization in a course refers to course content and/or pedagogic approaches which incorporate an intercultural and international perspective. Examples may include:

- Collaboration with overseas institutions to develop and adopt international course content, or to arrange international field trip
- Insertion of international theme as part of the course
- Integrating the course content with international material as examples or case studies
- Elements to provide global diversified perspectives and/or practices around the world

Please briefly list or summarize any component(s) in the course that contributes to internationalizing the curriculum:

2.8 *Resources*

Request extra resources for teaching this course? (X) No ◯ Yes

ELEC4210: Control System Design

Lecture Outline

Week	Description
1	Stabilization
2	Regulation, 2DOF controllers
3	Case study 1
4	Performance analysis
5	Optimal control
6	Case study 2
7	Uncertain system analysis
8	Robust control
9	Case study 3
10	State-space analysis
11	State-space synthesis
12	Case study 4
13	Advanced topics

Section 4: Development, Concurrence and Approval

4.1 *Contribution to the Program Learning Outcomes*

(To be completed by EACH of the program(s) of study noted under Section 1.2)

[x] The course contributes to this Major/Minor* Program: *BEng(ELEC)*

(Delete as appropriate)*

[x] The relevant **program learning outcomes are attached.**

[x] On behalf of this program of study, I confirm that the course will contribute appropriately to overall program learning outcomes.

	Position / Name:	Signature	Date
Program Director / Head of Department:	Prof. Bertram SHI, DH		18 NOV 2020

[ ] The course contributes to this Major/Minor* Program: _____

(Delete as appropriate)*

[ ] The relevant **program learning outcomes are attached.**

[ ] On behalf of this program of study, I confirm that the course will contribute appropriately to overall program learning outcomes.

	Position / Name:	Signature	Date
Program Director / Head of Department:			

4.2 *Approvals*

Department/Program unit level Recommendation

	Position / Name:	Signature	Date
[ ] Offering Department/Program Unit: *(Please specify unit):ECE*	Prof. Weichuan YU UG coordinator		18 NOV 2020
[x] Recommending School/IPO: *(Please specify):* SENG	Prof. Philip K. T. MOK Assoc. Dean of Engineering		14 Dec 2020

School-level Concurrence

	Name of School/Unit	Position / Name	Signature	Date
[ ]	*MAE*	Prof. Baoling Huang/UG Coord.		18/11/2020
[ ]	*DDP*			
[ ]				
[ ]				
[ ]				

Section 4: Development, Concurrence and Approval

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(Delete as appropriate)*

[x] The relevant **program learning outcomes are attached.**

[x] On behalf of this program of study, I confirm that the course will contribute appropriately to overall program learning outcomes.

	Position / Name:	Signature	Date
Program Director / Head of Department:	Prof. Bertram SHI, DH		18 NOV 2020

[ ] The course contributes to this Major/Minor* Program: _____

(Delete as appropriate)*

[ ] The relevant **program learning outcomes are attached.**

[ ] On behalf of this program of study, I confirm that the course will contribute appropriately to overall program learning outcomes.

	Position / Name:	Signature	Date
Program Director / Head of Department:			

4.2 *Approvals*

Department/Program unit level Recommendation

	Position / Name:	Signature	Date
[ ] Offering Department/Program Unit: *(Please specify unit):ECE*	Prof. Weichuan YU UG coordinator		18 NOV 2020
[ ] Recommending School/IPO: *(Please specify):* SENG			

School-level Concurrence

Name of School/Unit	Position / Name	Signature	Date
[ ] *MAE*			
[ ] *DDP*	UGC / Betty Lin		
[ ]			
[ ]			
[ ]			