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 2021-2022 Term Fall

b) Department Code[3]: ISDN Subject Area[3]: ISDN Course Number [4]: 2601

Previous Course Code[5]: New Course

c) Full Title[6] *(max. 100 characters)*: Internet of Things: From Component Skills to System Integration

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

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

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

This course introduces the fundamental concepts and skills on how to design an IoT (Internet of Things) system. The course includes fundamental theory and practical hands-on labs and projects for the student to acquire the basic knowledge on several key components for IoT systems, including circuits and sensors, signal processing, embedded systems, and communication and networking. The integration of different components is an important topic for this course. The students will acquire the knowledge through lectures, practical hands-on labs, and projects.

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

h) [ ] Prerequisites[11]:

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

i) [ ] Corequisites[12]:

Course Code	Course Title

j) [x] Exclusions[13]:

Course Code / Public Exam	Course Title / Exam Subject and Level / Grade attained
ELEC1200	A System View of Communications: from Signals to Packets

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):* See section 1.3

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		
Integrative Systems and Design (ISDN)	[X] Required Course	[ ] 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]

This proposed course is a required course for the second-year students in ISD. Students are going to learn about the component skills and system integration for Internet of Things (IoT). This course covers basic knowledge in several areas of electronic engineering including sensor and circuits, signal and system, communications, etc. After taking this course, student should be equipped with basic knowledge for IoT and ready to take higher level courses in related areas.

Before the official launching of ISDN2601, a pilot run of this course in special topic format (ISDN4000G) will be offered in Fall & Spring 20-21

For ISD students who completed ELEC1200, they would not be required to take ISDN2601. ISD would allow them to use ELEC1200 to replace ISDN2601 as course deviation.

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	Describe how an IoT system works	A
2	Identify the basic components of an IoT system	A
3	Learn how different components are integrated	A
4	Acquire hands-on experiment technique	B
5	Apply the knowledge in designing simple IoT system	B
6	Carry out performance analysis of an IoT system	B
7	Work and communicate effectively in a team	B
8	Conduct personal reflection from time to time	B

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: _____ISDN_____ **Program ILOs**	**To be achieved through these course ILOs** *(Write CILO-1, CILO-2, etc.)*
1	Be capable to identify and formulate problems in a multidisciplinary environment with an understanding of science, engineering, technology, business and design issues and constraints	CILO-1, CILO-2, CILO-3, CILO-6
2	Develop innovative problem-solving skills through hands-on learning and application of knowledge of science, engineering and design in integrative systems	CILO-4
3	Integrate knowledge and skills using a team-based, project-based pedagogy to be experts in tackling challenging problems considering ethics and societal needs	CILO-7, CILO-8
4	Be able to communicate and perform as a design expert in individual and team-based environments	CILO-7
5	Be life-long learners	CILO-5
6		
7		
8		

	Program of study 2: _____ **Program ILOs**	**To be achieved through these course ILOs** *(Write CILO-1, CILO-2, etc.)*
1		
2		
3		

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*	**2**	**CILO-1, CILO-2, CILO-3, CILO-5 and CILO-6**	
	[ ] Tutorial*			
	[ ] Seminar/Small-class*			
	[X] Laboratory*	**2**	CILO-4, CILO-7, CILO-8	
	*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)*
[x] In-class test	**10%**	**CILO-1, CILO-2, CILO-3, CILO-5, CILO-6, CILO-8**	
[x] Mid-term test	**25%**	**CILO-1, CILO-2, CILO-3, CILO-5, CILO-6, CILO-8**	
[ ] Final exam			
[x] Written assignment	**10%**	**CILO-1, CILO-2, CILO-3, CILO-4, CILO-5, CILO-6, CILO-8**	
[x] Project report	**20%**	**CILO-1, CILO-2, CILO-3, CILO-4, CILO-5, CILO-6, CILO-7**	
[x] Presentation	**5%**	**CILO-1, CILO-2, CILO-3, CILO-4, CILO-5, CILO-6, CILO-7**	
[ ] Learning portfolio			
[ ] Course participation			
[ ] Peer evaluation			
[x] Others (e.g. proctored online exam, etc.), *pls specify:* ___Lab_____	**30%**	**CILO-1, CILO-2, CILO-3, CILO-4, CILO-5, CILO-6, CILO-7**	

2.5 *Course Duration*

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

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

[x] Every Fall
[ ] Every Winter
[ ] Every Spring
[ ] Every Summer
[ ] No fixed pattern
[ ] Other *(pls specify):* _____

2.7 *Course outline attached*

( ) No (X) 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

ISDN 2601: Internet of Things: From Component Skills to System Integration

Course Description:

The course introduces the fundamental concepts and skills on how to design an IoT (Internet of Things) system. The course includes fundamental theory and practical hands-on labs and projects for the student to acquire the basic knowledge on several key components for IoT systems, including circuits and sensors, signal processing, embedded systems, and communication and networking. The integration of different components is an important topic for this course. The students will acquire the knowledge through lectures, practical hands-on labs, and projects.

Intended learning outcomes (ILOs) of the course:

- Describe how an IoT system works
- Identify the basic components of an IoT system
- Learn how different components are integrated
- Acquire hands-on experiment technique
- Apply the knowledge in designing simple IoT system
- Carry out performance analysis of an IoT system

Coverage:

Part I: Circuits and Sensors

1. Introduction
2. Circuits
3. Amplifier
4. Sensor
5. Actuator

Part II: Signal Processing

1. Signals and systems
2. Analog to digital conversion
3. Impulse response
4. Frequency analysis
5. Analog Modulation

Part III: Communication and Networking

1. Communication systems
2. Source coding
3. Channel coding
4. Modulation
5. Networking, MQTT
6. Machine Learning and Data Analytics

Lab Arrangement

1. Lab1: Circuits and amplifier
2. Lab2: Sensor and actuator
3. Lab3: ADC
4. Lab4: Frequency analysis and analog modulation
5. Lab5: Source and channel coding
6. Lab6: Networking and MQTT

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: *BSc in Integrative Systems and Design*

(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:	Head of ISD / Prof. Chi Ying TSUI		30 Nov 2020

[ ] The course contributes to these Major and Minor* Programs: _____

(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
[x] Offering Department/Program Unit: *(Please specify unit):* ISD	Head of ISD / Prof. Chi Ying TSUI		30 Nov 2020
[ ] Offering Department/Program Unit: *(Please specify unit):*			
[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
[x]	~~CEI~~			
[x]	ECE			
[ ]				
[ ]				
[ ]				

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: *BSc in Integrative Systems and Design*

(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:	Head of ISD / Prof. Chi Ying TSUI		30 Nov 2020

[ ] The course contributes to these Major and Minor* Programs: _____

(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
[x] Offering Department/Program Unit: *(Please specify unit):* ISD	Head of ISD / Prof. Chi Ying TSUI		30 Nov 2020
[ ] Offering Department/Program Unit: *(Please specify unit):*			
[ ] Recommending School/IPO: *(Please specify)*:			

School-level Concurrence

	Name of School/Unit	Position / Name	Signature	Date
[x]	~~CEI~~			
[x]	ECE	Prof. Weichuan YU		3 Dec 2020
[ ]				
[ ]				
[ ]				