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 Spring

b) Department Code[3]: ISDN Subject Area[3]: ISDN Course Number [4]: 2602

Previous Course Code[5]: New Course

c) Full Title[6] *(max. 100 characters)*: Mechatronic Systems Design with Embedded Computing

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 provides an introductory experience into the design of mechatronic systems and the corresponding controller using embedded computing platform. The course includes fundamental theory and also practical hands-on labs and projects for the student to acquire the basic knowledge of designing mechatronic systems and using embedded system to control. In the lab sessions, students design and build a succession of mechatronic subsystems, leading to an integrated system in a final project. Lectures topics include embedded system design, basic electronics, use of sensors and actuators, system modelling, measurement and control, and appreciation of how mechatronic systems solve real-world problems.

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
ELEC 1100	Introduction to Electro-Robot Design
MECH 2907	Mechatronic Design and Prototyping

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 basic design knowledge and skill to build a mechatronic system to solve real world problems. This course covers basic knowledge on how to build a mechatronic system and using embedded system to build the controller. The course covers several areas of electronic engineering and mechanical engineering including sensor and circuits, embedded processor, system modelling, control function, instrumentation and measurement, etc. After taking this course, student should be equipped with basic knowledge for mechatronic system design and ready to take higher level courses in related areas.

Before the official launching of ISDN2602, a pilot run of this course in special topic format (ISDN4000I) will be offered in Spring 20-21.

For ISD students who completed ELEC1100 or MECH2907, they would not be required to take ISDN2602. ISD would allow them to use ELEC1100 or MECH2907 to replace ISDN2602 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 embedded system work and Learn how to program an embedded system and how the software and hardware work together	A
2	Learn the basics of electrical circuits and electronic devices	A
3	Learn the basics of sensor and actuator theory and able to design sensor circuits for simple applications	A
4	Learn the theoretical and practical aspects of measurement system design, system modelling and control system design	A
5	Gain hands-on experience in designing and constructing basic mechatronic systems as well implementing the control algorithms using embedded system	B
6	Appreciate how mechatronic systems solve the real-world problem	B
7	Work as a team to prototype a system	B
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: _____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-6, CILO-7
2	Develop innovative problem-solving skills through hands-on learning and application of knowledge of science, engineering and design in integrative systems	CILO-2, CILO-3, CILO-4, CILO-5, CILO-7
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- 1, CILO-6
4	Be able to communicate and perform as a design expert in individual and team-based environments	CILO-1, CILO-6, CILO-7
5	Be life-long learners	CILO-1, CILO-2, CILO-3, CILO-4, CILO-5, CILO-7
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		
4		

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

2.3 *Planned Teaching 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-4, CILO-5, CILO-6	
	[ ] Tutorial*			
	[ ] Seminar/Small-class*			
	[X] Laboratory*	2	CILO-1, CILO-2, CILO-3, CILO-5, CILO-7	
	*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.*			
	[X] Others (e.g. fieldtrip, visit, etc.), *pls specify:* *team work and meetings* *Course Project*	1	CILO-7	
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-4	
[x] Mid-term test	25%	CILO-1, CILO-2, CILO-3, CILO-4, CILO-5	
[ ] Final exam			
[x] Written assignment	10%	CILO-1, CILO-2, CILO-3, CILO-4	
[x] Project report	25%	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			
[x] Course participation	5%	CILO-6, CILO-7	
[ ] Peer evaluation			
[x] Others, *pls specify:* *_Lab reports*	20%	CILO-1, CILO-2, CILO-3, CILO-5, CILO-7	

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

2.7 *Course outline attached* ( ) No (X) Yes

2.8 *Resources*

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

ISDN 2602 Mechatronic Systems Design with Embedded Computing

Course Outline

Week #	Topic
1	Introduction to Mechatronics Systems and Embedded System
2	System Response modelling and analysis
3	Computer Organization – Embedded Processors and software
4	Embedded System Interface
5	Measurement and Manipulation principles
	Midterm
6	Sensors – Position Sensors, Drivers, Optical Encoder
7	Actuators – DC Motor, Servo Motor, Steppers
8	Data acquisition and conversion
9	Basic electronics and driver circuits
10	Control system design and tuning
11	Case studies in system integration
	Final Project Presentation

Textbook

Introduction to Mechatronics and Measurement Systems, 4th edition by D. Alciatore and M. Histand, McGraw-Hill, 2012.

Labs Outline

Five Labs will be held in the consecutive 5 weeks in group size of 2.

1. Embedded Systems Basic – Setting up and embedded programming
2. Implementing simple controller with embedded processors
3. Basic input and output system
4. Sensor modules, ADC
5. Pulse width modulation – PWM generation

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

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

School-level Concurrence

Name of School/Unit	Position / Name	Signature	Date
[x] *ECE*			
[x] *MAE*	UG Coordinator/Prof. Baoling Huang		2 Dec 2020
[x] ~~*CEI*~~			
[ ]			
[ ]			

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	Position / Name:	Signature	Date
Program Director / Head of Department:	Head of ISD / Prof. Chi Ying TSUI		30 Nov 2020

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	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
[ ] Recommending School/IPO: *(Please specify):*			

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