课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	**课程名称 Course Title**	智能硬件 Intelligent hardware
2.	**授课院系 Originating Department**	系统设计与智能制造学院 School of System Design and Intelligent Manufacturing (SDIM)
3.	**课程编号 Course Code**	SDM104
4.	**课程学分 Credit Value**	1
5.	**课程类别 Course Type**	任选课 Free Elective
6.	**授课学期 Semester**	秋季 Fall
7.	**授课语言 Teaching Language**	中文 Chinese
8.	**授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation& Contact （For team teaching, please list all instructors）**	尉进，工程师，系统设计与智能制造学院，weij@sustech.edu.cn WEI Jin，Engineer，SDIM，weij@sustech.edu.cn 吴海龙，高级实验师，系统设计与智能制造学院，wuhl@sustech.edu.cn Dr.WU Hailong,Senior Experimenter,SDIM,wuhl@sustech.edu.cn
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	待公布 To be announced
10.	**选课人数限额(可不填) Maximum Enrolment （Optional）**	30

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
学时数 Credit Hours	0	0	32		32

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 NA
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 NA
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 NA

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

- 了解智能硬件的历史和发展趋势。
- Learn about the history and trends of smart hardware.
- 了解智能硬件的原理、结构和支撑技术。
- Understand the principle, structure and supporting technology of intelligent hardware.
- 具备智能硬件的初步应用能力。
- Have the initial application capability of intelligent hardware.
- 合理利用智能技术及其软硬件为产品创新设计作支撑。
- Rational use of intelligent technology and its software and hardware to support product innovation and design.
- 在设计过程中充分发挥创造力，利用已有智能的技术和成果进行创新性设计。
- Unleash your creativity in the design process and make innovative designs using existing intelligent technologies and achievements.
- 提升产品设计的综合素养，延伸对相关学科知识的认识和了解。
- Improve the comprehensive literacy of product design, and extend the knowledge and understanding of related disciplines.

16. 预达学习成果 Learning Outcomes

- 通过教学使学生了解智能硬件技术的发展历史与趋势、基本的原理与构造；掌握智能硬件的初步应用能力；以智能硬件技术智能为支撑，结合产品设计的相关知识进行创新性智能产品设计。
- Enable students to understand the development history and trend of intelligent hardware technology, basic principles and structure; Master the initial application ability of intelligent hardware; With the support of intelligent hardware technology intelligence, combined with the relevant knowledge of product design, innovative intelligent product design is carried out.

- 课程中要求学生探索生活中常见的智能产品,并归纳总结其规律与特征。
- In the course, students are required to explore common smart products in their daily lives and summarize their rules and characteristics.
- 课程作业以平时作业与结课作业考核相结合。平时作业包括：设计资料收集整理、课堂讨论、设计方案构思等；结课作业为智能产品设计方案综合表现。
- The coursework is a combination of regular homework and final assignment assessment. The usual homework includes: design data collection and collation, class discussion, design scheme conception, etc., and the final assignment is the comprehensive performance of the intelligent product design scheme.

17. 课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）
Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Week	Lecture		Practice	Hours
	Lecture Title	Language	Learn or practice in Makerspace	
1	智能硬件概述 Overview of intelligent hardware	• Chinese	讲解部分： 了解智能硬件发展的基本脉络和趋势，了解智能硬件系统的基本结构支撑条件、熟悉智能硬件在产品中的应用领域。 1-1 智能硬件技术的发展历史与趋势。 1-2 智能系统的基本结构特征。 1-3 智能硬件的相关支持技术。 1-4 智能硬件在产品设计中的应用。 实践部分： 智能硬件开发板下载代码、熟悉编程界面。 Lecture Section: Understand the basic context and trend of the development of intelligent hardware, understand the basic structural support conditions of intelligent hardware systems, and be familiar with the application fields of intelligent hardware in products. 1-1 The development history and trend of intelligent hardware technology. 1-2 Basic structural characteristics of intelligent systems. 1-3 Supporting technologies for smart hardware. 1-4 Application of intelligent hardware in product design. Practical Part: Download the code from the smart hardware development board and familiarize yourself with the programming interface.	2
2	智能硬件系统的组成 Composition of an intelligent hardware system	• Chinese	讲解部分： 了解和掌握智能硬件系统的组成与基本原理。 2-1 智能硬件系统的组成与功能。 2-2 智能硬件的输入系统。 2-3 智能硬件的输出系统。 2-4 语音识别与合成。 2-5 智能硬件系统的人机交互。	2

			实践部分： 熟悉智能硬件套件的各个模块。 Lecture Section: Understand and master the composition and basic principles of intelligent hardware systems. 2-1 Composition and function of the intelligent hardware system. 2-2 Input system of intelligent hardware. 2-3 Output system of intelligent hardware. 2-4 Speech recognition and synthesis. 2-5 Human-computer interaction of intelligent hardware systems. Practical Part: Familiarize yourself with the individual modules of the Smart Hardware Suite.	
3	智能硬件的关键技术 Key technologies for intelligent hardware	• Chinese	讲解部分： 了解智能硬件系统的接口、数据转换、算法等关键技术。 3-1 智能硬件系统的接口。 3-2 DAC 和 ADC 转换。 3-3 智能系统的基本算法和测量算法。 3-4 系统中的误差与修正。 实践部分： 熟悉智能硬件开发板的硬件接口、使用传感器进行实验。 Lecture Section: Understand key technologies such as interfaces, data conversions, and algorithms for intelligent hardware systems. 3-1 Interfaces of intelligent hardware systems. 3-2 DAC and ADC conversion. 3-3 Basic algorithms and measurement algorithms of intelligent systems. 3-4 Errors and corrections in the system. Practical Part: Familiar with the hardware interface of the smart hardware development board and the use of sensors for experiments.	2
4	智能硬件的输入部分 The input part of the intelligent hardware	• Chinese	讲解部分： 详细讲解输入部分的原理和编程方法。 实践部分： 熟练使用常见的输入模块。 Lecture Section: The principle and programming method of the input part are explained in detail. Practical Part: Proficiency in the use of common input modules.	2
5	智能硬件的输出部分 The output part of the intelligent hardware	• Chinese	讲解部分： 详细讲解输出部分的原理和编程方法。 实践部分： 熟练使用常见的输出模块。 Lecture Section: The principle and programming method of the output part are explained in detail. Practical Part: Proficiency in the use of common output modules.	2

6	智能硬件的通讯技术 Communication technology for smart hardware	• Chinese	讲解部分： 讲解各类应用在智能系统中的有线通讯和无线通讯技术。 实践部分： 使用通讯连接智能硬件。 Lecture Section: Explain the wired communication and wireless communication technologies used in various intelligent systems. Practical Part: Use communication to connect to smart hardware.	2
7	智能硬件在实际中的应用 The application of intelligent hardware in practice	• Chinese	讲解部分： 认识了解实际产品的智能硬件架构，并合理运用于产品设计当中。进行智能产品设计案例分析。 实践部分： 拆解小米、涂鸦等智能硬件产品。进行智能系统设计。 Lecture Section: Understand the intelligent hardware architecture of the actual product and apply it to the product design reasonably. Conduct smart product design case studies. Practical Part: Disassemble smart hardware products such as Xiaomi and Tuya. Carry out intelligent system design.	2
8	期中报告 Mid-Term Presentation	• Chinese	每组 15 分钟 Presentation。 15-minute presentations for each group.	2
9-15	项目开发制作 Project development and production	• Chinese	每周课上进行智能系统设计过程中的技术答疑。 Answer technical questions in the process of intelligent system design.	14
16	期末报告 Final Presentation	• Chinese	每组 12 分钟 Presentation 和 3 分钟项目演示。 Each group has a 12-minute presentation and a 3-minute project presentation.	2

18. 教材及其它参考资料 Textbook and Supplementary Readings

[1] 刘修文．智能硬件开发入门． 中国电力出版社．2018 年 4 月
[2] 《无线电》编辑部. Arduino 智能硬件开发入门．人民邮电出版社．2016 年 7 月
[3] 《无线电》编辑部. Arduino 智能硬件开发进阶．人民邮电出版社．2016 年 8 月
[4] 藏下雅之. Arduino 传感器玩转电子制作． 人民邮电出版社． 2016 年 9 月
[5] Micbael Margolis. Arduino 权威指南（第 2 版）.人民邮电出版社. 2015 年 3 月

课程评估 ASSESSMENT

19.

评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance	Week 1-16	5	NIL	
作品演示	Week 1-16	30	NIL	To assess students' achievement in

Bite-size demo				domain knowledge.
期中报告 Mid-Term Presentation	Week 8	30	NIL	To assess a student's self-directed learning ability, hands-on skill and intrinsic motivation.
期末报告 Final Presentation	Week 16	35	NIL	To assess the overall achievement of the teams.

20. 记分方式 **GRADING SYSTEM**

☑ A. 十三级等级制 **Letter Grading**
☐ B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority