

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	智能仪器设计与创新实践 Design of intelligent instruments & Innovation
2.	授课院系 Originating Department	创新创业学院 ICOLLEGE
3.	课程编号 Course Code	IN0003
4.	课程学分 Credit Value	2
5.	课程类别 Course Type	通识通修选修课程 General Education (GE) Elective Courses
6.	授课学期 Semester	秋季学期 Fall semester
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)	张冬 ZhangDong, 创新创业学院 ICOLLEGE, zhangd6@sustc.edu.cn, 13323587131
9.	实验员/助教、所属学系、联系方式（请列出本课所有教辅人员） Tutor/TA(s), Contact (Please list all)	尹明 YinMing, 创新创业学院 ICOLLEGE, yinm@mail.sustc.edu.cn
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	40

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	16		32		48

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	有基本的编程基础（不限编程语言种类） Fundamental programming basics (Any programming languages)
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	
14. 其它要求修读本课程的学系 Cross-listing Dept.	

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives	<p>本课程在学习传感器、信号处理、软件等知识和技术基础上侧重讨论智能仪器实际设计过程中所涉及的具体方法与技巧，具有很强的理论性、实用性和综合性。通过理论教学、实验教学和引导学生自主探索，培养学生智能仪器开发方面的综合创新实践能力。</p> <p>On the basis of learning sensors, signal processing, software and other knowledge and techniques, this course focuses on the specific methods and techniques involved in the actual design process of intelligent instruments, and it is highly theoretical, practical and comprehensive. Through theoretical teaching, experimental teaching and guiding students to explore independently, the comprehensive innovative practical ability of the student in intelligent instrument development is cultivated.</p>
16. 预达学习成果 Learning Outcomes	<p>通过本课程的学习，使学生了解智能仪器软硬件相结合的基本工作原理、主要技术和设计方法，结合实际仪器开展系统设计，着力培养学生运用所学知识与技术开展综合设计和创新实践的能力。并通过课程的实验环节和项目训练，使学生具备一定的智能测控仪器的设计和开发能力，为将来从事智能仪器的工作打下坚实的基础。</p> <p>Through the study of this course, the students will be able to understand the basic working principles, main techniques and design methods of the combination of the hardware and software of intelligent instruments. Implementing the system design combined with practical instruments, the student is cultivated to develop the abilities of integrated design and innovative practice by using knowledge and technology they have learned. Through the experimental teaching and project training of the courses, students are enabled with certain design and development capabilities of the intelligent measurement and control instrument, which lays a solid foundation for future work on intelligent instruments.</p>
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.)	

一、教学日历 Calendar

教 学 内 容	讲授	实验/实践	合计
第一讲：绪论 Lecture 1 Introduction	2	0	2
第二讲：Python 语言程序设计入门 Lecture 2 Introduction to Python Language Programming	4	6	10
第三讲：智能机器人机接口设计及应用 Lecture 3: Design and Application of Intelligent Instrument Man-Machine Interface	2	4	6
第四讲：智能仪器测量与控制接口技术 Session 4 Intelligent Instrument Measurement and Control Interface Technology	2	4	6
第五讲：Python 机器视觉入门 Lecture 5 Introduction to Python Machine Vision	2	8	10
第六讲：智能仪器典型实例 Lecture 6: Typical Examples of Intelligent Instruments	2	4	6
第七讲：智能仪器设计实践与应用创新 Lecture 7: Design Practice and Application Innovation of Intelligent Instrument	2	6	8
合 计	16	32	48

二、课程内容 Content

第一讲 绪论

Lecture 1 Introduction

内容：1、智能仪器的基本概念；2、智能仪器的分类与应用；3、智能仪器的关键技术；4、典型智能仪器案例剖析；5、智能仪器设计方法；6、智能仪器技术发展趋势。

Contents: 1. Basic concepts of intelligent instruments; 2. Classification and application of intelligent instruments; 3. Key technologies of intelligent instruments; 4. Example analysis of typical intelligent instrument; 5. Design methods of intelligent instruments; 6. Trends of intelligent instrument technology.

第二讲 Python 语言程序设计入门

Lecture 2 Introduction to Python Language Programming

内容：1、Python 语言概述；2、Python 语言的特点和应用；3、Python 语言基本语法；4、Python 语言 GUI 技术；5、在 Raspberry Pi 实验板上实验 Python 上述课程内容。

Contents: 1. Overview of Python language; 2. Features and applications of Python language; 3. Basic syntax of Python language; 4. Python language GUI technology; 5. Experiment Python above course content on the Raspberry Pi experiment plank.

第三讲 智能机器人机接口设计及应用

Lecture 3: Design and Application of Intelligent Instrument Man-Machine Interface

内容：1、人机接口的概念和典型技术；2、交互式图形界面；3、语音交互界面；4、在 Raspberry Pi 实验板上实验图形+语音混合交互界面的设计。

Contents: 1. Concept and typical technology of human-machine interface; 2. Interactive graphical interface; 3. Voice interaction interface; 4. Design the experimental graphic + speech mixed interactive interface on Raspberry Pi experiment plank.

第四讲 智能仪器测量与控制接口技术

Session 4 Intelligent Instrument Measurement and Control Interface Technology

内容：1、接口技术的基本概念、分类；2、A/D 接口技术与应用；3、D/A 接口技术与应用；4、常用的测量传感器；5、常用信号处理算法；6、在 Raspberry Pi 实验板和扩展板上实验上述课程内容。

Content: 1. Basic concept and classification of interface technology; 2. Technology and application of A / D interface; 3. Technology and application of D / A interface; 4. Commonly used measurement sensors; 5. Commonly used signal processing; 6. Experiment above course content on Raspberry Pi experiment plank and expansion board.

第五讲 Python 机器视觉入门

Lecture 5 Introduction to Python Machine Vision

内容：1、机器视觉的概念；2、机器视觉典型应用系统分析；3、机器视觉常用算法；4、Opencv 机器视觉函数库的使用；5、在 Raspberry Pi 实验板上实验上述课程内容。

Content: 1. Concept of machine vision; 2. Analysis of the typical application system for machine vision; 3. Commonly used algorithm of machine vision; 4. Usage of Opencv machine vision library; 5. Experiment above course content on Raspberry Pi experiment plank.

第六讲：智能仪器典型实例

Lecture 6: Typical Examples of Intelligent Instruments

内容：1、超声波测距仪实例剖析；2、虚拟示波器实例剖析；3、智能相机实例剖析。

Contents: 1. Example analysis of ultrasonic rangefinder; 2. Example analysis of virtual oscilloscope; 3. Example analysis of smart camera.

第七讲：智能仪器设计实践与应用创新

Lecture 7: Design Practice and Application Innovation of Intelligent Instrument

内容：1、结合课程前面所学的各种器件和控制方法由学生自行设定应用场景，实现一个类似超声波测距仪、虚拟示波器、智能相机等的小型智能仪器系统并且完成课程报告。

Contents: 1. Combining the various devices and control methods learned in the course, the students set their own application scenarios to make a small intelligent instrument system similar to the ultrasonic rangefinder, virtual oscilloscope, and smart camera etc., and complete the course report.

教材 Textbook:

《全国高等院校仪器仪表及自动化类“十二五”规划教材:智能仪器》，付华 著电子工业出版社, 2013;

参考资料 Reference :

- 1、《智能仪器设计基础》，王祁著，机械工业出版社，2010
- 2、《智能化测量控制仪表原理与设计》，徐爱钧, 徐阳编著, 北京航空航天大学出版社, 2012(第3版);
- 3、《树莓派开发实战》，[英]Simon Monk 蒙克著，人民邮电出版社，2017(第2版)

教学评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估所需时间 Duration	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10%		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		45%		
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		45%		
其它(可根据需要 改写以上评估方式) Others (The above may be modified as necessary)				

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

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