

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	传感技术 Sensing Technology				
2.	授课院系 Originating Department	机械与能源工程系 Department of Mechanical and Energy Engineering				
3.	课程编号 Course Code	ME425				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业选修课 Major Elective Course				
6.	授课学期 Semester	春季学期 Spring				
7.	授课语言 Teaching Language	英文 English				
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)	方绚莱 机械与能源工程系 Nicholas Xuanlai Fang Department of Mechanical and Energy Engineering				
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)					
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	32		32		64

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	ME307 控制工程基础 Fundamentals of Control Engineering
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**

1. Exposure to different sensor types to measure multiple classes of physical parameters:
2. Identify and/or list different types of actuator technology
3. Define the advanced applied math topics and describe their potential applications

16. 预达学习成果 **Learning Outcomes**

1. **Experimentation and data collection:** Use actuators, data acquisition equipment, and sensors to create and measure system input and output signals, and vary experimental parameters as needed to produce useful data
 - a. Recognize useful vs. useless measured signals and if necessary resolve issues such as inadequate signal to noise ratio, resolution limitations, inadequate sample rate, and clipping by varying experimental parameters.
 - b. Ensure useful frequency information can be obtained from a measured signal by recognizing and removing aliasing by increasing the sample rate until the Nyquist frequency is greater than the highest frequency present in the signal or by adding an anti-aliasing filter to remove signal frequencies greater than the Nyquist frequency.
2. **Data analysis:** Draw conclusions from measurements using both numerical and analytical methods
 - a. Use filtering to remove noise or signal at unwanted frequencies, e.g. to increase the signal to noise ratio.
 - b. Create a parametric model from data by using curve fitting (parameter estimation) tools to determine a function of best fit and the values of the best-fit parameters with uncertainty and evaluate whether the assumed functional form is statistically significant
3. **Communication:** Communicate an experimental background, methods, results, and conclusions through oral, visual, and written communication, including an abstract, in a style and format suitable for publication in a refereed journal or presentation at a conference in the field.
 - a. Present data in a graphical form acceptable for publication in a peer-reviewed journal or presentation at a professional conference in the field.

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.)

4. **Experimentation and data collection:** Use actuators, data acquisition equipment, and sensors to create and measure system input and output signals, and vary experimental parameters as needed to produce useful data
 - a. Recognize useful vs. useless measured signals and if necessary resolve issues such as inadequate signal to noise ratio, resolution limitations, inadequate sample rate, and clipping by varying experimental parameters.
 - b. Ensure useful frequency information can be obtained from a measured signal by recognizing and removing aliasing by increasing the sample rate until the Nyquist frequency is greater than the highest frequency present in the signal or by adding an anti-aliasing filter to remove signal frequencies greater than the Nyquist frequency.
5. **Data analysis:** Draw conclusions from measurements using both numerical and analytical methods
 - a. Use filtering to remove noise or signal at unwanted frequencies, e.g. to increase the signal to noise ratio.
 - b. Create a parametric model from data by using curve fitting (parameter estimation) tools to determine a function of best fit and the values of the best-fit parameters with uncertainty and evaluate whether the assumed functional form is statistically significant
6. **Communication:** Communicate an experimental background, methods, results, and conclusions through oral, visual, and written communication, including an abstract, in a style and format suitable for publication in a refereed journal or presentation at a conference in the field.
 - a. Present data in a graphical form acceptable for publication in a peer-reviewed journal or presentation at a professional conference in the field.

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

《传感器实战全攻略，41个创客喜爱的Arduino与Raspberry Pi制作项目》
作者:[芬]Tero Karvinen、Kimmo Karvinen、Ville Valtokari;出版社:人民邮电出版社;出版时间:2016年06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		5		
课堂表现 Class Performance		15		Participation in Q&As
小测验 Quiz				
课程项目 Projects		30		Go Forth presentations
平时作业 Assignments		30		Lab assignments and reports
期中考试 Mid-Term Test				
期末考试 Final Exam				

期末报告 Final Presentation	20		Poster presentation and Final paper
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**

<input checked="" type="checkbox"/> A. 十三级等级制 Letter Grading <input type="checkbox"/> 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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