

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	智能机器人技术 Intelligent Robot 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	ME403				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业核心课 Major Core Course				
6.	授课学期 Semester	春季学期 Spring				
7.	授课语言 Teaching Language	中英双语 Chinese-English bilingual				
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)	智能机器人技术 Intelligent Robot Technology				
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	ME306 机器人基础 Fundamentals of Robotics
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**

《智能机器人技术》是机械制造领域内机器人与自动化方向的专业课程，该课程为中英双语授课，系统性讲授机器人嵌入式控制的理论、部件、子系统知识，等。

通过本课程的讲授及实验项目将使学生掌握机器人理论知识、提高对实际问题的分析能力和解决能力、培养学生国际化思维以及团队协作管理复合能力。

Intelligent Robot Technology is the core course of robotics in the field of mechanical manufacturing. The course will be taught in both English and Chinese. The theories, components, sub-system of robot and the corresponding embedded system will be presented.

The projects based on experiments help students to master the corresponding knowledge about robotics and automation, improve their practical ability and train their international thinking method and team cooperation.

16. 预达学习成果 **Learning Outcomes**

《智能机器人技术》课程通过系统性讲授机器人控制的嵌入式技术方面的理论、部件、子系统等知识，并采用课程分组项目实现以学生掌握知识为目标，提高学生实际能力、培养学生国际化思维以及团队协作管理复合能力的目标，为未来从事该领域的理论和应用研究，培养兴趣，并打下坚实的基础。

Intelligent Robot Technology will present the theories, components, sub-system of embedded system and servo control about robot. The projects based on experiments help students to master the corresponding knowledge about robotics and automation, improve their practical ability and train their international thinking method and team cooperation.

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	内容 Contents
1 (2 课时) 1 (2 hours)	嵌入式系统及 ARM 处理器体系基本架构 Basic framework of embedded system and architecture of ARM processing unit
2 (2 课时) 2 (2 hours)	STM32 IO 口与串口通信 STM32 IO Port and Serial Port Communication

3 (2 课时) 3 (2 hours)	STM32 中断方式、原理与控制 STM32 Interruption mode, principle and Control
4 (2 课时) 4 (2 hours)	系统自启动与看门狗管理模式 System Self-startup and Watchdog Management Model
5 (2 课时) 5 (2 hours)	通用定时器模式、原理与控制 Mode, Principle and Control of Universal Timer
6 (2 课时) 6 (2 hours)	PWM 信号原理、生成方式及应用 Principle, Generation and Application of PWM Signal
7 (2 课时) 7 (2 hours)	数据输入捕获及电容触摸相应 Data Input Capture and Capacitance Touch Correspondence
8 (2 课时) 8 (2 hours)	内存数据保护及系统安全性分析 Memory Data Protection and System Security Analysis
9 (2 课时) 9 (2 hours)	TFTLCD 控制方式及图形图像显示原理 TFTLCD Control Mode and Graphic and Image Display Principle
10 (2 课时) 10 (2 hours)	SDRAM 存储原理、接口及控制 SDRAM Storage Principle, Interface and Control
11 (2 课时) 11 (2 hours)	RTC 实时时钟原理与控制方式 RTC Real-time Clock Principle and Control Mode
12 (2 课时) 12 (2 hours)	系统硬件随机数生成及待机唤醒模式 System Hardware Random Number Generation and Standby Wake-up Mode
13 (2 课时) 13 (2 hours)	ADC (模数转换)/DAC (数模转换) 原理与控制方法 ADC/DAC Principle and Control Methods
14 (2 课时) 14 (2 hours)	DMA (直接存储器存取) 原理与工作模式 The Principle and Working Mode of DMA (Direct Memory Access)
15 (2 课时) 15 (2 hours)	IIC (Inter-integrated circuit) 与 CAN (Controller area network) 总线原理与控制模式 IIC (Inter-integrated circuit) and CAN (Controller area network) Bus Principle and Control Mode
16 (2 课时) 16 (2 hours)	复习与项目答辩 Review and dissertation of project
实验 Experiments	

1. MDK5 开发环境安装与配置 (第 1 周, 2 节课)
1. MDK5 installation and configuration of development environment (week 1. 2 hours)
2. 跑马灯、按键输入实验 (第 2 周, 2 节课)
2. Running Horse Lamp and Keyboard Input Experiments (week 2. 2 hours)
3. 串口通信、外部中断实验 (第 3 周, 2 节课)
3. Serial Communication and External Interrupt Experiments (week 3. 2 hours)
4. 独立看门狗、窗口看门狗实验 (第 4 周, 2 节课)
4. Independent Watchdog and Window Watchdog Experiments (week 4. 2 hours)
5. 定时器中断实验 (第 5 周, 2 节课)
5. Timer interrupt experiment (week 5. 2 hours)
6. PWM 输出实验 (第 6 周, 2 节课)
6. PWM output experiment (week 6. 2 hours)
7. 电容触摸按键实验 (第 7 周, 2 节课)
7. Capacitance touch key experiment (week 7. 2 hours)
8. 内存保护实验 (第 8 周, 2 节课)
8. Memory protection experiment (week 8. 2 hours)
9. TFTLCD 实验 (第 9 周, 2 节课)
9. TFTLCD experiment (week 9. 2 hours)
10. SDRAM 实验 (第 10 周, 2 节课)
10. SDRAM experiment (week 10. 2 hours)
11. RTC 实时时钟实验 (第 11 周, 2 节课)
11. Real time experiment (week 11. 2 hours)
12. 硬件随机数、待机唤醒实验 (第 12 周, 2 节课)
12. Hardware Random Number and Standby Wake-up Experiments (week 12. 2 hours)
13. ADC 实验 (第 13 周, 2 节课)
13. ADC experiment (week 13. 2 hours)
14. 内部温度传感器、DAC 实验 (第 14 周, 2 节课)
14. Internal Temperature Sensor and DAC Experiments (week 14. 2 hours)
15. DMA 实验 (第 15 周, 2 节课)
15. DMA experiment (week 15. 2 hours)
16. IIC 实验 (第 16 周, 2 节课)
16. IIC experiment (week 16. 2 hours)

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

1. STM32F7原理与应用——HAL库版, 北京航空航天大学出版社, 2017年07月 Principle and Application of STM32F7 - HAL Library Edition, Beijing University of Aeronautics and Astronautics Press, July 2017
2. 嵌入式系统原理及接口技术, 刘彦文, 清华大学出版社, ISBN: 9787302240303, 2011年3月第1版 Principle of embedded system and interface technology. Yanwen Liu, Tsinghua press, ISBN: 9787302240303, 1st edition in 2011.03

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				
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		70		
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation				
其它 (可根据需要 改写以上评估方 式) Others (The above may be modified as necessary)		30 (实验部分)		

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

