

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	现代控制理论及应用 Multi-variable Control and Applications
2.	授课院系 Originating Department	School of System Design and Intelligent Manufacturing
3.	课程编号 Course Code	SDM364
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业核心课 Major Core Courses
6.	授课学期 Semester	秋季 Fall
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)	丘立 教授 系统设计及智能制造学院 邮箱: qiul3@sustech.edu.cn QIU Li School of System Design and Intelligent Manufacturing Email: qiul3@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)	50

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	48	0	0	0	48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA127 高等数学(下), MA113 线性代数, EE207 工程数学或 SDM234 高等工程数学, EE205 信号和系统或 SDM246 信号与系统, SDM263 自动控制理论 MA127 Calculus II, MA113 Linear Algebra, EE207 Engineering Mathematics or SDM234 Advanced Engineering Mathematics, EE205 Signals and Systems or SDM246 Signals & Systems, SDM263 Feedback Control Theory.				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	SDM464 最优控制与估计 Optimal control and estimation				
14. 其它要求修读本课程的学系 Cross-listing Dept.	电子与电气工程系、机械与能源工程系、数学系 Department of Electric and Electronic Engineering, Department of Mechanical and Energy Engineering and Department of Mathematics.				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

This course will introduce the students to the fundamental concepts and methods in modern control theory. Topics include state-space modelling of dynamical systems, analysis of LTI state-space systems, stabilizing controller design, elementary optimal control.

本课程将向学生介绍现代控制理论的基本概念和方法。主题包括动态系统的状态空间建模, 状态空间系统的分析与综合, 镇定控制器设计, 最优控制入门。

The course will also touch the applications of modern control theory to mechanical, electrical, and aerospace systems.

该课程还将讨论现代控制理论在机械、电气和航空航天系统中的应用。

16. 预达学习成果 Learning Outcomes

1. 掌握现代控制理论的基础知识。Become knowledgeable in the basic concepts and methods in modern control theory.
2. 理解控制理论与工程问题的联系。Understand the connection of control theory and engineering problems.
3. 熟练运用线性代数于工程理论。Become capable of using linear algebra in engineering theory.
4. 学会 MATLAB 的使用。Learn the use of MATLAB.

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.)

- I. Mathematical Preliminaries: Linear algebra supplement,
- II. LTI State space systems analysis: Solutions of state-space equations, Controllability, Observability, Kalman Decomposition, MIMO system poles and zeros, Stability and Lyapunov equation, System connections.
- III. Transfer matrix realization: minimality, realization from Hankel matrix, balanced realization.
- IV. Control system design: Pole placement, Luenberger observer, observer-based control and separation principle, Youla Parametrization.
- V. Elementary optimal control: Riccati equation, LQR and H2 (LQG) control, separation principle again. (Advanced topic, taught if time allows)
- VI. Case study.

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

待定 To be announced.

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				
平时作业 Assignments		30%		
期中考试 Mid-Term Test		30%		
期末考试 Final Exam		40%		
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)**

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

