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	**EEE5026 无线通信系统优化** **Optimization of Communication Systems**
2.	授课院系 Originating Department	电子与电气工程系 Department of Electronic and Electrical Engineering
3.	课程编号 Course Code	EEE5026
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	中英双语 English & 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）	刘凡，电子与电气工程系，liuf6@sustech.edu.cn Fan Liu, Department of Electronic and Electrical Engineering，liuf6@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）	

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	0

12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	线性代数，微积分 Linear Algebra, Calculus
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite	N/A
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

Study how key problems in communication systems, both point-to-point and networked systems, can be formulated and solved as various forms of linear or nonlinear optimization problems. Introduce the tools of linear and convex optimization and Lagrange duality. Study both theoretical properties and computational algorithms of the optimization methodology, through specific applications to the analysis and design of communication systems.

16. 预达学习成果 Learning Outcomes

Through learning this course, the students shall be able to understand the basic principles of convex optimization, and how the optimization theory and techniques are applied to design wireless communication systems.

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 1: Overview and Mathematical Background

Week 2: Convex Sets and Convex Functions

Week 3: Convex Optimization Problems

Week 4: Lagrangian Duality

Week 5: Linear Programming (LP)

Week 6: Quadratic Programming (QP)

Week 7: Semidefinite Programming (SDP)

Week 8: Second-Order Cone Programming (SOCP)

Week 9: Geometric Programming (GP)

Week 10: Gradient Descent Methods and Newton's Methods

Week 11: Interior-Point Methods

Week 12: Case Study 1: Multi-User MIMO Beamforming

Week 13: Case Study 2: MIMO Detection

Week 14: Case Study 3: Symbol-Level Precoding

Week 15: Case Study 4: Integrated Sensing and Communications (ISAC)

Week 16: Case Study 5: Reconfigurable Intelligent Surface (RIS) aided Wireless Networks

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

[1] Chi, C.-Y., Li, W.-C., & Lin, C.-H. (2017). Convex Optimization for Signal Processing and Communications: From Fundamentals to Applications (1st ed.). CRC Press, 2017

[2] Boyd, Stephen, Stephen P. Boyd, and Lieven Vandenberghe. Convex optimization. Cambridge university press, 2004.

[3] Palomar, D.P. and Eldar, Y.C. eds., 2010. Convex optimization in signal processing and communications. Cambridge university press.

[4] Zhi-Quan Luo and Wei Yu, "An introduction to convex optimization for communications and signal processing," in IEEE Journal on Selected Areas in Communications, vol. 24, no. 8, pp. 1426-1438, Aug. 2006

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 17	10%		
课堂表现 Class Performance	Week 17	0%		

小测验 **Quiz**	Week 17	0%		
课程项目 **Projects**	Week 17	0%		
平时作业 **Assignments**	Week 17	0%		
期中考试 **Mid-Term Test**	Week 17	0%		
期末考试 **Final Exam**	Week 17	0%		
期末报告 **Final Presentation**	Week 17	90%		
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