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	**信息论与编码 Information Theory and Coding**
2.	授课院系 Originating Department	电子与电气工程系 Department of Electrical and Electronic Engineering
3.	课程编号 Course Code	EE411
4.	课程学分 Credit Value	2
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	秋季 Fall
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）	王锐 电子与电气工程系 wang.r@sustech.edu.cn Rui Wang Department of Electrical and Electronic Engineering
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	无 NA
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	32				32

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	MA212 概率论与数理统计 MA212 Probability and Statistics
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	Postgraduate Courses
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**

本课程旨在让学生理解和掌握信息论和编码的基础知识，包括如下两个基础性问题：数据压缩的极限是多少；通信速率的极限是多少。在理解上述极限的基础上，本课程还将让学生掌握接近上述极限的信源和信道编码方法。

This course will provide an introductory look into the broad areas of information theory and coding theory. As stated in the course text, “Information theory answers two fundamental questions in communication theory: what is the ultimate date compression (answer: the entropy H) and what is the ultimate transmission rate of communication (answer: the channel capacity C). Some coding techniques will be discussed which approach these ultimate limits.

16. **预达学习成果 Learning Outcomes**

通过课程的学习，学生将具备如下能力：

1. 掌握信息论的基础知识和概念，包括若干经典的证明。
2. 应用信息论解释通信系统的若干基本极限。
3. 能够在信息和通信系统中使用若干种基本的信源和信道编码技术。
4. 具备在信息论和通信工程领域进一步深造的能力。

After completing this course, the students will be able to

1. Understand the basic concepts and fundamentals of information theory, including some classical proofs in information theory.
2. Use the information theory to explain some fundamental limitations of communication systems.
3. Conduct basic source and channel coding in information or communication systems.
4. Conduct more advanced study in information theory and communication engineering.

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.)

1. Probability review.
2. Entropy: entropy, relative entropy, mutual information, chain rules, data processing inequality, the asymptotic equipartition property, entropy rates for stochastic processes.
3. Data Compression: the Kraft inequality, Shannon-Fano codes, Huffman codes, arithmetic codes.
4. Channel Capacity: discrete channels, channel coding theorem, Gaussian channels, rate distortion theory.
5. Error Control Coding: linear block codes and their properties, Hamming codes, hard-decision decoding, cyclic codes, convolutional codes, soft-decision decoding.

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

Thomas M. Cover, Joy A. Thomas, Elements of Information Theory, 2nd Edition, Wiley-Interscience, 2006

信息论基础[Elements of Information Theory],第一版，Thomas M. Cover, Joy A. Thomas, 清华大学出版社

Raymond W. Yeung, Information Theory and Network Coding, Springer, 2008

F. J. MacWilliams, N.J.A. Sloane, The Theory of Error-Correcting Codes, North-Holland, 1977.

Shu Lin, D. J. Costello, Error Control Coding, 2nd edition, Principles of Mobile Communication, 2004.

19. 课程评估 ASSESSMENT

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		15		
课程项目 Projects				
平时作业 Assignments		15		
期中考试 Mid-Term Test				
期末考试 Final Exam		45		
期末报告 Final		25		

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
