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**	概率论 Probability Theory
2.	**授课院系 Originating Department**	数学系 Department of Mathematics
3.	**课程编号 Course Code**	MA215
4.	**课程学分 Credit Value**	4
5.	**课程类别 Course Type**	专业选修课 Major Elective Courses
6.	**授课学期 Semester**	春/秋季 Spring/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）**	孙景瑞，助理教授，数学系 慧园 3 栋 402 室(答疑时间：周一、周三下午 2:30-4:00) sunjr@sustech.edu.cn Jingrui SUN, Assistant Professor, Department of Mathematics Rm. 402, Huiyuan 3 Bldg. (Office hours: Monday, Wednesday 2:30pm-4:00pm) sunjr@sustech.edu.cn
9.	**实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact**	助教：智彦朋，数学系 创园 8 栋 105 室 12032928@mail.sustech.edu.cn TA: Yanpeng ZHI, Department of Mathematics Rm. 105, Innovation Park No.8. 12032928@mail.sustech.edu.cn
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	16	无 N/A	无 N/A	64

12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	数学分析 II 或者 高等数学（下） Mathematical Analysis II or Calculus AII
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite	MA314 应用随机过程、金融数学 MA314 Applied Stochastic Processes、Financial Mathematics
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

To introduce the basic concepts in probability theory which forms the basis for all applications of probability and statistics, and for further probability and statistical theory including, in particular, stochastic processes. Also, to introduce the basic probability methods and techniques with a strong emphasis on applying these standard methods and techniques appropriately and with clear interpretation. The emphasis is on applications. The basic teaching goal is to grasp the basic concepts regarding random variables, random vectors, functions of random variables, expectation, variances, covariance, and central limit theorems and the related important conclusions and theorems and to study their extensive applications in many fields. The basic aim is to teach students to handle the basic theory and fundamental methods and technologies for random phenomenon, to train students' scientific thinking and problem analysis and problem-solving skills, and to lay a good foundation for the subsequent courses in modern probability theory.

本课程介绍概率论的最基本概念，它们组成了概率和统计的应用基石。本课程也为进一步学习其他概率和统计课程,例如随机过程，打下良好的基础。本课程还重点介绍了一些基本的概率方法和技巧，且强调它们的实际应用及概率解释。基本教学目标是掌握关于随机变量、随机向量、随机变量的函数、期望、方差、协方差和中心极限定理及相关重要结论和定理，研究他们在许多领域广泛应用。基本目标是教会学生处理随机现象的基本理论和基本方法技巧，培养学生的科学思维和分析解决问题的能力，并为后续课程打下良好的现代概率论基础。

16. 预达学习成果 Learning Outcomes

After completing this course, students should master the basic concepts and methods in probability theory. After learning this course, the students should be familiar with a range of methods and techniques for solving real life problems of the probabilistic nature. In particular, after learning this course, the students should be able

1．to master the basic knowledge, deeply to understand and master the nature of the definitions, theorems, probability laws, principles and formulae. After the study, the students should be able not only to remember the above concepts and the basic probability laws including conditions and conclusions, but also deeply to understand the basic principles and ideas of probability theory;

2．to master the basic skills and be able to compute expectations and probabilities according to law and formula correctly;

3．to train the ability of thinking and to enhance the ability to do research regarding random variables;

4. to improve the ability of solving practical problems. After learning this course, students should be able to use the learned knowledge to establish a suitable probability model and to solve the life related mathematical problems.

完成本课程后，学生应掌握概率论的基本概念和方法，熟悉各种概率方法和技巧，并能解决现实生活提出的问题，了解其概率特性。特别是在学习本课程后，学生应该能够

1.掌握基本知识，深入理解和掌握定义、定理、原则和公式本质。学习后，学生应该能够不仅记住概念和基本概率方法，同时也能深刻理解概率论的基本原理和理念。

2.掌握基本技能，并能根据概率规律和公式正确计算期望和概率。

3.培养思维能力，提高对事物的观察、比较和概括的能力。

4.提高解决实际问题的能力。学习本课程后，学生应该能够使用学到的知识对实际问题建立合理的概率模型，从而解决相关的数学问题。

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.)

Ch1. Introduction (2 hours): Introduction; Baby Set Theory; Combinatorial Methods; Binomial Coefficients; Binomial Theorems.

Ch2. Probability Space (4 hours): Sample Spaces; Events; The Probability of an Event; Some Rules of Probability; Conditional Probability; Independent Events; Bayes' Theorem.

Ch3: Discrete & Continuous Random Variables (10 hours): Random Variables; Discrete Random Variables; Probability Distributions; Probability Mass Functions; Binomial Random Variable; Poisson Random Variable; Continuous Random Variables; Probability Density Functions; Uniform Distributions; Exponential Distributions; Gamma Distributions; Normal Distributions; Functions of a Random Variable.

Ch4: Random Vectors & Joint Distributions (8 hours): Multivariate Random Variables; Joint and Marginal Distribution Functions; Independent Random Variables; Bivariate Normal Distributions; Multivariate Normal Distributions; Transformation of Random Vectors.

Ch5: Mathematical Expectations (14 hours): Expected Value of a Random Variable; Basic Properties of Expectation; Variance of a Random Variable; Moments; Covariance and Correlation of Random Vectors; Property of Expectation of Function of Random Variables; Distribution Function Techniques; Transformation Technique for One Variable and Several Variables; Sum and Ratio of Two Random Variables; Moment Generating Functions: Properties and Applications; Normal Generated Distributions: Chi-Square Distribution, T-Distribution, and F-Distribution.

Ch6: Limit Theorems (8 hours): Weak Law of Large Number; Central Limit Theorems; Sample Mean, Sample Variance.

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

Required: Rice, J.A., Mathematical Statistics and Data Analysis, 3rd Ed, Duxbury Press, 2007, ISBN 0-534-39942-8.
（Main materials: Chapters 1-6）

Recommended:

1. Douglas G. Kelly, Introduction to Probability, Macmillan Publishing Company, 1994, ISBN 0-02-363145-7.
2. Sheldon Ross, A First Course in Probability, 4th Ed, Macmillan Publishing Company, 1994, ISBN 0-02-403872-5.

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		10%		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20%		
期中考试 Mid-Term Test	2 hours	20%		
期末考试 Final Exam	2 hours	50%		
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