

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	数理统计基础 (Foundations of Mathematical Statistics)
2.	授课院系 Originating Department	数学系
3.	课程编号 Course Code	MA236
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	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 Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	张艺赢, 助理教授, 数学系, zhangyy3@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 (请保留相应选项 Please only keep the relevant information)
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	80

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
	48				48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	概率论、线性代数或高等代数、高等数学或数学分析				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	非寿险精算、计算金融、时间序列分析、金融时间序列、衍生证券模型与定价等				
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

本课程在概率论的基础上讲解统计的概念与统计方法，讲述统计的两大主题—估计与假设检验，分别讲述点估计、区间估计、假设检验、分布检验等。一方面，向同学们介绍更深层次的数理统计的知识，一方面，希望借此能够激发学生科研的兴趣，掌握统计学的基本技能，如数据的收集、整理、分析和解释。培养学生具备扎实的统计学知识和技能，能够在实际应用中解决实际问题，并具备批判性思维、团队合作和沟通能力。

This course covers the concepts and methods of statistics based on probability theory, and introduces the two main themes of statistics - estimation and hypothesis testing. Topics covered include point estimation, interval estimation, hypothesis testing, distribution testing. The course aims to introduce students to deeper knowledge of mathematical statistics while also inspiring their interest in scientific research and developing their basic statistical skills, such as data collection, organization, analysis, and interpretation. The course aims to cultivate students' solid understanding of statistical knowledge and skills, their ability to solve practical problems in real-world applications, and their critical thinking, teamwork, and communication skills.

16. 预达学习成果 Learning Outcomes

学生较好地掌握数理统计的基础知识，熟练掌握估计的具体方法，假设检验的概念与步骤，假设检验各种条件下不同检验方法，不同分布的检验方法，理解其背后的统计学原理，并且能够用所学知识解决实际问题。

Students have a good grasp of the basic knowledge of mathematical statistics, proficient in the specific methods of estimation, the concepts and steps of hypothesis testing, different test methods under various conditions of hypothesis testing, different distribution test methods, understand the statistical principles behind it, and be able to use the knowledge learned to solve practical problems.

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. 统计量与抽样分布（6学时）

1.1 总体和样本

1.2 统计量与估计量

1.3 抽样分布

1.4 次序统计量

1.5 充分统计量

1.6 常用的概率分布族

2. 点估计（12学时）

2.1 矩估计与相合性

2.2 最大似然估计与渐进正态性

2.3 最小方差无偏估计

2.4 C-R 不等式

2.5 贝叶斯估计

3. 区间估计（12学时）

3.1 置信区间

3.2 正态总体参数的置信区间

3.3 大样本置信区间

3.4 贝叶斯区间估计

4. 假设检验（14学时）

4.1 假设检验的概念与步骤

4.2 正态均值的检验

4.3 两正态均值差的推断

4.4 成对数据的比较

4.5 正态方差的推断

4.6 比率的推断

4.7 广义似然比检验



5. 分布的检验 (4 学时)
 - 5.1 正态性检验
 - 5.2 柯莫格罗夫检验
 - 5.3 卡方拟合优度检验

1. Statistics and Sampling Distribution (6 hours)
 - 1.1 Population and Sample
 - 1.2 Statistics and Estimators
 - 1.3 Sampling Distribution
 - 1.4 Order Statistics
 - 1.5 Sufficient Statistics
 - 1.6 Common Families of Probability Distributions

2. Point Estimation (12 hours)
 - 2.1 Method of Moments and Consistency
 - 2.2 Maximum Likelihood Estimation and Asymptotic Normality
 - 2.3 Minimum Variance Unbiased Estimation
 - 2.4 Cramer-Rao Inequality
 - 2.5 Bayesian Estimation

3. Interval Estimation (12 hours)
 - 3.1 Confidence Interval
 - 3.2 Confidence Interval for Normal Population Parameters
 - 3.3 Large Sample Confidence Interval
 - 3.4 Bayesian Interval Estimation

4. Hypothesis Testing (14 hours)
 - 4.1 Concept and Steps of Hypothesis Testing
 - 4.2 Testing Normal Mean
 - 4.3 Inference for the Difference of Two Normal Means
 - 4.4 Paired Comparison

4.5 Inference for Normal Variance
4.6 Inference for Proportions
4.7 Generalized Likelihood Ratio Test
5. Distribution Testing (4 hours)
5.1 Normality Test
5.2 Kolmogorov Test
5.3 Chi-square goodness of fit test

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

参考教材：数理统计学（第二版），茆诗松、吕晓玲著
其他教材：数理统计 (第二版)，韦来生

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	6-8 次	25%		
期中考试 Mid-Term Test	2 小时	25%		
期末考试 Final Exam	2 小时	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