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	随机分析 Stochastic Analysis
2.	授课院系 **Originating Department**	数学系 Mathematics
3.	课程编号 **Course Code**	MAT7029
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**）	熊捷，讲座教授，数学系 慧园 3 栋 527 Jie Xiong, Chair Professor, Department of Mathematics Block 3 Room.527, Wisdom Valley
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				48

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	MA215 Probability Theory， MA301 Theory of Functions of a Real Variable；MA215 概率论，MA301 实变函数
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	
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

这门课的目标是在概率论的基础上，掌握随机分析的基础理论与方法，并会介绍基本的随机微分方程理论和倒向随机微分方程理论。

This course, based on the preliminary knowledge of Probability Theory, will discuss the basic theory and methods in Stochastic Analysis. It then introduces Stochastic Differential Equations Theory. The basic theory and methods of Backward Stochastic Differential Equations will also be covered.

16. 预达学习成果 Learning Outcomes

1. 掌握随机分析的基础理论与方法。
2. 了解基础的随机微分方程理论。
3. 了解基本的倒向随机微分方程的理论与方法。

1. Master the basic theory and methods of Stochastic Analysis.
2. Understand the basic theory of. Stochastic Differential Equations.
3. Understand the basic theory and methods of Backward Stochastic Differential Equations.

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. 初步（8 课时）：条件期望；离散时间鞅; Doob 可选抽样定理;上、下鞅; 鞅不等式；鞅收敛定理；连续时间鞅等。
   Preliminaries (8 hours): Conditional Expectation; Discrete time Martingale; Doob's Optional Sampling Theorems; Supermartingales and Submartingales; Martingale Inequalities; Martingale Convergence Theorems, Introduction to Continuous Time Martingales, etc.

2. 布朗运动（8 课时）：布朗运动定义、分布，流；鞅性质；二次变差；马尔科夫性；首中时；反射原理等。
   Brownian Motion(BM) (8 hours): Definition of BM; Distribution of BM; Filtration for BM; Martingale Property for BM; Quadratic Variation; Markov Property of BM; First Passage Time Distributions; Reflection Principle, etc.

3. Itô 积分（16 课时）：Itô 积分定义；Itô-Doeblin 公式;分部积分；随机 Fubini 定理；Girsanov 定理；布朗鞅与表示定理；Feynman-Kac 表示等。
   Itô Integrals (16 hours): Definition of Itô's Integral; Itô-Doeblin Formula; Integration by parts; Stochastic Fubini Theorem; The Girsanov Theorem; The Brownian Martingale Representation Theorem; The Feynman-Kac Representation, etc.

4. 随机微分方程理论（8 课时）
   Stochastic Differential Equations (8 hours)

5. 倒向随机微分方程（8 课时）
   Backward Stochastic Differential Equations (8 hours)

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

1. J. Xiong. An Introduction to Stochastic Filtering Theory. Oxford Graduate Texts in Mathematics, 18. Oxford University Press, 2008.

2. Jiongmin Yong and Xunyu Zhou, Stochastic Control: Hamiltonian Systems and HJB Equations

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		20%		
期中考试 Mid-Term Test		30%		
期末考试 Final Exam		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)**		4	

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

> 数学系课程规划与审核委员会
> Curriculum Planning and Review Committee, Department of Mathematics