

## 课程大纲 COURSE SYLLABUS

1.	<b>课程代码/名称 Course Code/Title</b>	MAT8030 现代概率论 Advanced Probability
2.	<b>课程性质 Compulsory/Elective</b>	核心课程 Core Course
3.	<b>课程学分/学时 Course Credit/Hours</b>	3/45
4.	<b>授课语言 Teaching Language</b>	双语: 英语和中文 Bilingual: English and Chinese
5.	<b>授课教师 Instructor(s)</b>	熊捷教授 Jie Xiong, Professor
6.	<b>是否面向本科生开放 Open to undergraduates or not</b>	是 Yes
7.	<b>先修要求 Pre-requisites</b>	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)  无区分 No difference
8.	<b>教学目标 Course Objectives</b>	<p>(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)</p> <p>After learning this course, students should be able</p> <ol style="list-style-type: none"> <li>1. to deeply understand and master the basic concepts and conclusions of modern probability theory, not only to remember these basic concepts and the basic probability laws including conditions and conclusions, but also deeply to understand the basic principles and ideas of modern probability;</li> <li>2. to fully master the four basic convergence theorems (Monotone Convergence Theorem, Fatou Lemma, Dominated Convergence Theorem, and Bounded Convergence Theorems) and be able to apply them in many important topics and different problems;</li> <li>3. to clearly understand the probability meaning, difference, and relationships of several kind of convergence concepts (almost everywhere convergence; convergence in measure/probability; Convergence in <math>L_p</math> Norm; Weak Convergence) and be able to apply them in different problems;</li> <li>4. to fully master the very important concepts of conditional expectations and conditional probabilities and to improve the ability of solving practical problems by applying the basic probability methods of "conditioning".</li> <li>5. to clearly understand and master the basic concepts regarding martingales including the existence, uniqueness, properties and applications of martingales, super- and sub-martingales and be able to apply the important martingale method in the study of modern theory of stochastic processes, stochastic analysis and financial mathematics.</li> </ol>
9.	<b>教学方法 Teaching Methods</b>	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)

1. Pay attention to the newly and recently obtained conclusions. In the teaching process, I'll combine the important classic results with the newly obtained results together to ensure the advance of this course.
2. In the teaching, I'll pay much attention to the important and difficult concepts and conclusions. Class interaction is strongly encouraged.
3. We will emphasize the rigorous of the proof with aim of training student on how to write mathematical proofs of the theorems.
4. The presentation is a combination of ppt and blackboard. The ppt will hand over to students so taking notes is not necessary.

**10. 教学内容**

**Course Contents**

(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)

<b>Section 1</b>	Basic probability models (9h)
<b>Section 2</b>	Construction of probability measures and random variables (7h)
<b>Section 3</b>	Integration with respect to probability measures (2h)
<b>Section 4</b>	Independent random variables (2h)
<b>Section 5</b>	Probability distributions (3h)
<b>Section 6</b>	Characteristic functions (5h)
<b>Section 7</b>	Convergence of random variables (8h)
<b>Section 8</b>	Conditional expectation (2h)
<b>Section 9</b>	Martingales, super and submartingales (5h)
<b>Section 10</b>	
.....	

**11. 课程考核**

**Course Assessment**

(①考核形式 Form of examination; ②. 分数构成 grading policy; ③如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)

1. Assignments: 30% (include quiz 5%); 2. Mid-term test: 30%; 3. Final Exam (2h): 40%.

**12. 教材及其它参考资料**

**Textbook and Supplementary Readings**

Textbook: Jean Jacod & Philip Protter, 《Probability Essentials》, Springer-Verlag, Berlin Heidelberg.

Supplementary Readings:

David Williams, 《Probability with Martingales》, Cambridge University Press, Cambridge, 1991.