课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	MAT7098 随机控制与投资组合理论 Stochastic Control & Portfolio Optimization
2.	**课程性质** **Compulsory/Elective**	选修 Elective
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	中英双语 Chinese & English
5.	**授课教师** **Instructor(s)**	孙景瑞，助理教授 Jingrui Sun, Assistant Professor
6.	**是否面向本科生开放** **Open to undergraduates or not**	是 Yes
7.	**先修要求** **Pre-requisites**	MA212 概率论与数理统计（或 MA215 概率论），MA201a 常微分方程 A，MAT7093 随机分析，MA301 实变函数 Probability, Ordinary Differential Equations, Stochastic Analysis, Real Analysis
8.	**教学目标** **Course Objectives**	
	通过该课程的学习使学生熟悉随机控制中的贝尔曼最优化原理、动态规划原理、近似动态规划原理、极大值原理等方法，掌握一些典型最优控制问题的求解技术，并可熟练运用来解决投资组合优化问题。 Students are expected to understand main methods of stochastic control, such as Bellman's principle of optimality, dynamic programming, approximate dynamic programming, and maximum principle, to know how to solve some typical optimal control problems, and to utilize them to solve portfolio optimization problems.	
9.	**教学方法** **Teaching Methods**	
	PPT 结合板书授课。 Teach with PPT and blackboards.	
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.）	
	Section 1 (6 hours)	动态规划原理简介 Introduction to Dynamic Programming
	Section 2 (10 hours)	无穷时区上的折现问题 Infinite Horizon --- Discounted Problems
	Section 3 (8 hours)	随机最短路径问题 Stochastic Shortest Path Problems
	Section 4 (8 hours)	连续时间问题与均值-方差问题 Continuous-Time Problems and Mean-Variance Problems

	Section 5 (16 hours)	近似动态规划 Approximate Dynamic Programming

11. 课程考核
Course Assessment

10%考勤 + 30%作业 + 60%期末测试

10% Attendance + 30% Homework + 60% Final exam

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

1. D. P. Bertsekas. Dynamic Programming and Optimal Control, Vol. I, 4th ed. Athena Scientific, Belmont, 2017.
2. D. P. Bertsekas. Dynamic Programming and Optimal Control, Vol. II, 4th ed.: Approximate Dynamic Programming. Athena Scientific, Belmont, 2012.
3. J. Yong and X. Y. Zhou. Stochastic Controls: Hamiltonian Systems and HJB Equations, Springer-Verlag, New York, 1999.
4. J. Sun and J. Yong. Stochastic Linear-Quadratic Optimal Control Theory: DifferentialGames and Mean-Field Problems. SpringerBriefs in Mathematics, Springer, Cham, 2020.