MA280 Probability (Online)

Instructor Information	Shen Fan Home Institution: China University of Petroleum Email: fans@cup.edu.cn		
Term	June 27, 2022 - July 22, 2022	**Credits**	4 units
Course Delivery	The class will be delivered in the format of online. Other than recorded lecture videos, the instructor will arrange 4 hours' real-time interactions with students per week (via Tencent Meeting and WeChat group). The workload students are expected to complete to properly pass this course is about 10-15 hours per week.		
Required Texts (with ISBN)	A First Course in Probability, 10th Edition. S. Ross. Pearson ISBN-13: 9780134753119.		
Prerequisite	N/A		

Course Overview

This course introduces students to probability. Topics include probability spaces, conditional probability, independence, univariate random variables, multivariate random variables, random vectors, expectation, law of large numbers, central limit theorem.

Course Goals

A student who satisfactorily completes this course will be able to:

✧ understand the basic rules of probability, conditional probability and expectation;
✧ apply Bayes' theorem on changing conditional probabilities with new evidence;
✧ understand the difference between discrete and continuous random variables;
✧ work easily with several common distributions, discrete and continuous;
✧ know what expectation and variance mean and be able to compute them;
✧ understand the central limit theorem.

Exams

Midterm Exam (30%): 2 hours' Written Test

Final Exam (40%): 2 hours' Written Test

Grading Policy

Type	Description	Weight
Homework	Short answer questions	30%
Midterm Examination	Written Test; On-line Submission	30%
Final Exam	Written Test; On-line Submission	40%

Grading Scale

Number grade	Letter grade	GPA
90-100	A	4.0
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3.0
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2.0
62-64	C-	1.7
60-61	D	1.0
≤ 59	F (Failure)	0

Class Schedule

Date	Lecture	Readings	Online Teaching Arrangement
Day 1	Combinatorial Analysis	Chapter 1	approximately 80 minutes pre-recorded video lectures
Day 2	Axioms of probability, sample spaces having equally likely outcomes	Chapter 2	approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group
Day 3	Conditional probability, Bayes formula	Chapter 3	approximately 80 minutes pre-recorded video lectures
Day 4	Independent events, $P(\cdot\,|F)$ is a Probability	Chapter 3	approximately 80 minutes pre-recorded video lectures
Day 5	Discrete random variables, expectation and variance of discrete random variables,	Chapter 4	approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group
Day 6	Some Important Discrete Probability Distributions	Chapter 4	approximately 80 minutes pre-recorded video lectures
Day 7	Continuous random variables, expectation and variance of continuous random variables	Chapter 5	approximately 80 minutes pre-recorded video lectures
Day 8	Some important continuous probability Distributions, the distribution of a function of a random variable.	Chapter 5	approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group
Day 9	Jointly distributed random variables, joint distribution functions, independent random variables	Chapter 6	approximately 80 minutes pre-recorded video lectures
Day 10	Conditional distributions, order statistics, joint probability distribution of functions of random variables	Chapter 6	approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group
Day 11	Midterm		online Midterm Exam
Day 12	Properties of expectation, expectation and variance of sums of random variables, covariance and correlations	Chapter 7	approximately 80 minutes pre-recorded video lectures
Day 13	Conditional expectation, conditional expectation and prediction, moment generating functions	Chapter 7	approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group

Day 14	Additional properties of normal random variables, general definition of expectation	Chapter 7	approximately 80 minutes pre-recorded video lectures
Day 15	Chebyshev's inequality and the weak law of large numbers, the central limit theorem, the strong law of large numbers	Chapter 8	approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group
Day 16	Other inequalities and a Poisson limit result	Chapter 8	Approximately 80 minutes pre-recorded video lectures
Day 17	A Brief Introduction to Additional Topics in Probability	Chapter 9	approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group
Day 18	A Brief Introduction to Simulation	Chapter 10	approximately 80 minutes pre-recorded video lectures
Day 19	Final Review		approximately 80 minutes pre-recorded video lectures plus 120 minutes online interaction via Tencent Meeting and WeChat group
Day 20	Final Exam		On-line Submission