STAT 030: Probability

Term: 2020 Winter Session Instructor: Staff Language of Instruction: English Classroom: TBA Office Hours: TBA
Class Sessions Per Week: 6 Total Weeks: 4 Total Class Sessions: 25 Class Session Length (minutes): 145 Credit Hours: 4

Course Description:

The main purpose of this course is to help students be able to use and understand knowledge and use of probability, the science of uncertainty and data. Basic calculus skills about integration, differentiation, limits and functions are required for some topics in this course. Topics covered in this course include: basic concepts of probability; conditional probability; discrete and continuous random variables; expectation and variance; Joint Distribution; Conditional distributions, covariance and correlation coefficient, conditional expectations; Limit Theorems.

Course Materials:

Introduction to Probability, by Dimitri P. Bertsekas, John N. Tsitsiklis. Publisher: Athena Scientific; 2nd edition (July 15, 2008)

Course Format and Requirements:

This course has 25 class sessions in total. Each class session is 145 minutes in length.

The primary format of this course is lecture, problem solving and discussion. Familiarizing with the course material before class, you will gain a better understanding the information presented during lecture. Each student will be responsible for learning as much as possible. Students are strongly encouraged to ask questions on things you did not understand.

Attendance

Attendance will not be taken but all quizzes will be the taken at the beginning in class. Arriving late may cause you to miss a quiz, impacting your performance assessment. There is no made-up quiz.

Grading Scale:

A+: 98%-100%
A: 93%-97%
A-: 90%-92%
B+: 88%-89%
B: 83%-87%
B-: 80%-82%
C+: 78%-79%
C: 73%-77%
C-: 70%-72%
D+: 68%-69%
D: 63%-67%
D-: 60%-62%
F: Below 60%

Course Assignments:

Quizzes:

Quiz questions include calculation and multiple choices. There will be 8 quizzes in total. No make-up quiz will be given.

Midterms:

There will be two midterm exams throughout the session. Each exam accounts for 20% of the final grade. Midterm exam 1 will take place in week 2 while midterm 2 in week 3. Midterm 2 is

non-cumulative and the materials learned before midterm 1 will not be tested. The exams will be closed-book with two pages of notes allowed.

Final Exam:

The final exam is cumulative. Students are advised to review thoroughly before the final exam for it covers the materials learned through the whole session. The final exam will be closed-book with two pages of notes allowed.

Course Assessment:

Quizzes	20%
Midterm exam 1	20%
Midterm exam 2	20%
Final exam	40%
Total	**100%**

Course Schedule:

Week	Topics	Activities
1	Review of math: sets; sequences and series; infinite series limits; countable sets Probability axioms: sample space, probability axioms, extended properties from axioms, discrete and continuous examples. Conditioning and Bayes' rule: conditional probabilities, axioms and properties of conditional probabilities, multiplication rule, total probability theorem, Bayes' rule. Independence: Independence of two events, conditional independence, independence of multi events, pairwise independence, reliability.	Quiz 1 Quiz 2

2	Counting: counting principle, counting for calculate probabilities, combinations, binomial probabilities, partitions, coin toss problems and more changes, birthday problems, forming a committee problem Definition of random variables Discrete random variables: PMF, Bernoulli R.V., use Bernoulli as indicator, uniform discrete R.V., binomial R.V., Geometric R.V. Expectation, properties of expectation, expected value rule, linearity of expectations. Variance, properties, conditional variance, total expectation calculation. Variance and expectation of Bernoulli, uniform, binomial and geometric R.V. Joint PMF of discrete R.V.	Midterm 1 Quiz 3 Quiz 4
3	Continuous random variables, PDF, find mean and variance of uniform distribution CDF of uniform distribution PDF and CDF of exponential distribution Normal random variables, the normal table, calculate normal probability Conditioning on a continuous R.V., total probability and expectation applied on continuous R.V., mixed R.V. Joint PDF of continuous R.V., finding marginal PDF from joint PDF, joint CDFs. Conditional PDFs, total probability and total expectation under conditioning, independence and independence under conditioning, PMF of linear function of one, two and more R.V.'s Covariance and properties, correlation coefficient, interpretation of covariance Sum of independent normal R.V.'s and its variance	Quiz 5 Midterm 2 Quiz 6

4	Conditional expectation as a R.V., law of iterated expectation, conditional variance, more on sum of independent R.V.'s The Markov inequality, the Chebyshev inequality, the weak law of large numbers Convergence in probability and examples The Central Limit Theorem; More CLT examples and exercises; Polling. Classical statistical framework introduction.	Quiz 7 Quiz 8 Final Exam

Academic Integrity:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Zhejiang University's Academic Conduct Code. Any work suspected of violating the standards of the Academic Conduct Code will be reported to the Dean's Office. Penalties for violating the Academic Conduct Code may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the Academic Conduct Code.

Special Needs or Assistance:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.