East China Normal University
GEC International Summer School

MAT 31: Probability and Statistics 1

Term: June 17th to July 19th, 2024
Class Hours: Monday through Friday, 110 minutes each day (2,750 minutes in total)
Instructor: TBD
Home Institution: TBD
Office Hours: TBD
Email: TBD

Course Description

This is the first course in the Probability and Statistics. The course covers the basic principles of the Introduction to Probability and Its Applications. Topics include combinatorial analysis used in computing probabilities, the axioms of probability, conditional probability, and independence of events; discrete and continuous random variables; joint, marginal, and conditional densities, moment generating function; laws of large numbers; various distributions. Assignments and other exercises will be required during whole summer study.

Prerequisite: MAT 12 Calculus 2 (better with MAT23 Calculus 3)

Required Text

Mathematical Statistics with Applications, 7th Edition, by Dennis D. Wackerly, William Mendenhall III, Richard L. Scheaffer.

ISBN: 978-0-495-11081-1

Course Hours

The course has 25 class sessions in total. Each class session is 110 minutes in

length, for a total of 2750 minutes of in-class time. The course meets from Monday to Friday. ECNU awards 3 credits for this course. Different universities may count course credits differently. Consult officials at your own home institution.

Attendance

Summer school is very intense and to be successful, students need to attend *every class*. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. ECNU policy requires a medical certificate to be excused. Any absence may impact on the student's grade. Moreover, ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.

Grading Policy

ECNU awards grades of A, A-, B+, B, B-, C+, C, D, and F. Most colleges and universities do not award transfer credit for grades of D or F.

In this course, grading will be based on the following:

Attendance/participation	10%
Assignments*3	10%*3=30%
Midterm Exam	25%
Final Exam	35%

General Expectations

Students are expected to:
- Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade.
- Arrive to class on-time: Late arrivals are disruptive to your fellow students and to the conduct of the class.
- Complete the day's required reading and assignments before class
- Review the previous day's notes before class; make notes about questions you have about the previous class or the day's reading

- Refrain from texting, phoning or engaging in computer activities unrelated to class during class (不要用手机) It is highly disrespectful to the professor and to the class.
- Participate in class discussions and complete required written work on time.

Course Schedule

The planned schedule sketched out below may be modified to suit the interests or abilities of the enrolled students or to take advantage of special opportunities or events that may arise during the term.

Week 1

- *Day 1*
    - *Course outline*
    - *Sets, experiments, sample space, events, counting rules (2.3-2.6)*
- *Day 2*
    - *Conditional probability of events, independence of events, multiplicative law of probability, additive law of probability, law of total probability, Bayes' Rule (2.7-2.10)*
- *Day 3*
    - *Random variables, random sampling (2.11-2.12)*
    - *Discrete probability distribution, expectation, variance (3.1-3.3)*
- *Day 4*
    - *Binomial distribution (3.4), negative binomial distribution (3.6*
- *Day 5*
    - *Tutorial/R-Lab*

Week 2

- *Day 1*
    - *Geometric distribution (3.5), hypergeometric distribution (3.7), Poisson distribution (3.8)*

- *Day 2*
    - *Moments and moment-generating functions (3.9)*
    - *Tchebysheff's Inequality (3.11*
- *Day 3*

- o *Continuous random variable, Continuous probability, mean, variance (4.1-4.3)*
- *Day 4*
  - o *Uniform distribution, normal distribution (4.4-4.5)*
  - o *Assignment 1 due*
- *Day 5*
  - o *Midterm review session*

Week 3

- *Day 1*
  - o *Midterm exam*
  - o
- *Day 2*
  - o *Exponential distribution, gamma distribution, beta distribution (4.6-4.7)*
- *Day 3*
  - o *4.8-4.10*
- *Day 4*
  - o *Bivariate distribution, multivariate distribution, marginal distribution, conditional distribution (5.2-5.3)*
- *Day 5*
  - o *Tutorial/R-Lab*

Week 4

- *Day 1*
  - o *Independent random variables (5.4)*
- *Day 2*
  - o *Expectations of functions of random variables, variance of two random variables (5.5-5.7)*
- *Day 3*
  - o *Expectation and variance of linear functions of random variables, multinomial distribution (5.8, 5.9)*
- *Day 4*
  - o *Conditional expectation (5.11)*
- *Day 5*
  - o *Tutorial/R-Lab*

Week 5

- *Day 1*
  - *Three methods of finding the probability distribution of a function of random variables: method of distribution function, method of transformations, method of moment-generating functions (6.2-6.5)*
- *Day 2*
  - *Statistic, sampling distribution related to normal distribution (7.1-7.2)*

- *Day 3*
  - *Central limit theorem, normal approximation to binomial distribution (7.3, 7.5)*
- *Day 4*
  - *Final review session*
- *Day 5*
  - *Final exam*

Academic Honesty

Students are expected to maintain high standards of academic honesty. Specifically, unless otherwise directed by the professor, students may not consult other students, books, notes, electronic devices or any other source, on examinations. Failure to abide by this may result in a zero on the examination, or even failure in the course.