



**East China Normal University
GEC International Summer School**

MAT 22: Introductory 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 course focuses on a general introduction to probability, statistics, and their applications. Topics include descriptive data analysis, elements of probability, common random variables (Bernoulli, Poisson, Normal, Gamma, Chi-square, F), sampling distribution, parameter estimation (Method of Moment and Maximum Likelihood Estimation), hypothesis testing (one-sample, two-sample and ANOVA), experimental design, simple linear regression.

Prerequisite: None

Course Overview

The goal of Statistics is to gain understanding from data. To gain understanding we operate on a set of numbers----we average or graph them, for example. But we must do more, because data are numbers from a context that helps us understand them. Thus, comparing with past data is an important part of the statistical exercise.

Learning Objective

A student who satisfactorily completes this course should:

1. Evaluate mean, median, mode, standard deviation, variance of a data set.
2. Understand basic probability rules.
3. Compute probabilities from a continuous distributions such as Normal Distribution, etc.



4. Compute probabilities from a discrete distributions such as Binomial Distribution, etc.
5. Understand sampling distributions (Central Limit Theorem).
6. Estimation methods, MOM and MLE.
7. Hypothesis testing: One & two sample mean and proportions.
8. Hypothesis testing: Anova. (including basic experimental design)
9. Correlation and simple linear regression.

Required Text

Introduction to Probability and Statistics for Engineers and Scientists, Third Edition by Sheldon M. Ross

ISBN: 9780125980579

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:



Assignments*5	5%*5=25%
Midterm Exam	35%
Final Exam	40%

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*
 - *Data Collection, Descriptive Statistics and Inferential Statistics*
 - *Populations and Samples*
 - *Chebyshev's Inequality, Law of Large Number*
 - *Types of Data*
- *Day 2*
 - *Sample Space and Event*
 - *Axioms of Probability*
 - *Sample Spaces Having Equally Likely Outcomes*



- *Conditional Probability*
- *Bayes' Formula*
- *Independent Events*
- *Day 3*
 - *Random Variables*
 - *Types of Random Variables*
 - *Jointly Distributed Random Variables**
 - *Expectation*
- *Day 4*
 - *Properties of the Expected Variables*
 - *Variance*
 - *Covariance and Variance of Sums of Random Variables**
- *Day 5*
 - *In-class exercises*
 - *Assignment 1 due*

Week 2

- *Day 1*
 - *Discrete R.V.*
 - *The Bernoulli and Binomial Distribution*
 - *The Poisson Distribution*
 - *The Hypergeometric Distribution*
- *Day 2*
 - *Continuous R. V.*
 - *The Uniform Distribution*
 - *Normal Distribution and corresponding Calculation*
- *Day 3*
 - *Exponential Distribution*
 - *Gamma Distribution*
 - *Chi-square Distribution*
 - *F Distribution*
- *Day 4*
 - *Sampling Distribution*
 - *The Central Limit Theorem*
- *Day 5*
 - *In-class exercises*
 - *Assignment 2 due*

Week 3



- Day 1
 - o Point estimation, Bias, MSE
 - o Sufficient and Consistent
- Day 2
 - o Midterm review
- Day 3
 - o Midterm
- Day 4
 - o Evaluating a Point Estimator, Method of Moments (MOM)
 - o Evaluating a Point Estimator, Maximum Likelihood Estimator (MLE)
- Day 5
 - o Common distributions' MOM and MLE.

Week 4

- Day 1
 - o Interval Estimates
 - o Introduction to one Sample Confidence Interval
- Day 2
 - o Introduction to two Sample Confidence Interval
 - o Prediction Interval
- Day 3
 - o Introduction to Hypothesis Testing
- Day 4
 - o Hypothesis Testing for two Samples
- Day 5
 - o In-class exercises
 - o Assignment 4 due

Week 5

- Day 1
 - o Basic Experimental Design
 - o Anova
- Day 2
 - o Simple Linear Regression and Correlation Coefficient
- Day 3
 - o Final review session
- Day 4



- *Final review session*
- *Day 5*
 - *Final exam*
 - *Assignment 5 due*

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.