



## Syllabus

Course No.	1900732W	College	Science	Dept.	Mathematics
Teacher	Juan Zhang				
Time	2022.12.19—2023.01.06				
Course Name	English	Mathematical Statistics			
	Chinese	数学统计			
Course credit hours	Total	Theory	Office Hour or Practice	Credits	
	70	60	10	12.0	
<b>Course description:</b> The course is a study of basic probability theory; discrete, continuous, and mixed random variables; expected values; moments; univariate probability distributions including the hypergeometric distribution, Bernoulli and binomial distributions, geometric and negative binomial distributions, Poisson distribution, discrete and continuous uniform distributions, exponential and gamma distributions, chi-square distributions, and normal distributions; joint probability distributions including the multivariate hypergeometric distribution, multinomial distribution, and bivariate normal distribution; covariance and correlation; and conditional probability distributions. Goals for this course include developing critical thinking skills, and the abilities to apply techniques of calculus (i.e., derivatives, integration, infinite series) to assess the probability of an event, to interpret the result of a statistical study, and to solve mathematical problems with the use of technology.					
<b>Requirements for courses; ability and knowledge in advance</b>					
The prerequisites are Calculus I and probability.					
<b>Course structure explanation:</b> Make clear the necessary parts, optional parts, distribution of hours. Courses with experiments or practice are expected to explain credit hours needed, content, scheme and functions.					

## **Chapter 1: Introduction**

The basic goal of statistics: draw conclusions based on data. There are various aspects of statistics ranging from formulating the question, designing experiments to address the question, collecting the data, and analyzing the data, but we'll be stressing the role of probability and probability distributions in this process. We'll often begin with a random sample drawn from a parameterized family of distributions, and our job is to make conclusions about the parameter.

## **Chapter 2: Review of Probability**

We'll quickly review the theory of probability. Sample spaces and events, Kolmogorov's axioms, principles of combinatorics including permutations and combinations, conditional probability and independence, Bayes' theorem, random variables, probability mass functions for discrete random variables, probability density functions for continuous random variables, cumulative distribution functions, expected value, mean and variance of a distribution, selected discrete and continuous distributions.

## **Chapter 3: Collecting Data**

Types of statistical studies, observational studies, basic sampling designs

## **Chapter 4: Summarizing and Exploring Data**

## **Chapter 5: Sampling Distributions of Statistics**

- 5.1. Sampling Distribution of the Sample Mean
- 5.2. Sampling Distribution of the Sample Variance
- 5.3. Student's t-distribution
- 5.4. Snedecor-Fisher's F-distribution

## **Chapters 6 and 15: Basic Concepts of Inference**

- 6.1. Point Estimation
- 6.2. Confidence Interval Estimation
- 6.3. Hypothesis Testing

## **Chapter 7: Inferences for Single Samples**

- 7.1. Inferences on Mean (Large Samples)
  - 7.2. Inferences on Mean (Small Samples)
  - 7.3. Inferences on Variance (if time permits)
- Bayesian inference for samples

## **Chapter 8: Inferences for Two Samples**

- 8.1. Independent Samples and Matched Pairs Designs
- 8.2. Graphical methods for comparing two samples
- 8.3. Comparing Means of Two Populations, independent samples and matched pairs

## **Chapter 9: Inferences for Proportions and Count Data**

- 9.1. Inferences on Proportion

## 9.2. Inferences on Comparing Two Proportions

### Chapter 10: Simple linear regression and correlation

The least squares method

10.1. The model for simple linear regression

10.2. Fitting a line, goodness of fit

10.3. Statistical inference with the simple linear regression model, prediction and confidence intervals

### Teaching methods (Lectures, practice, etc.)

Lectures and self-study

### Forms of evaluation and requirements

Structure of the final grade(including presence, class performance ), focus of exam, forms of exam(test, interview, final report, etc)

Homework and final exam

Textbook	Name	Publisher	Author	Year	Price
	Probability and Statistical Inference,	9th edition	Hogg, Tanis And Zimmerman		
College					