

AMS 412 (3 credits, Fall 2022) Mathematical Statistics

Instructor	Myoungshic Jhun Professor, Department of Applied Mathematics & Statistics, SUNY Korea
Class	Mon, Wed 3:30 pm - 4:50 pm, Room (TBA)
Office	B519
Office Hour	Mon, Wed 1:30 pm – 3:00 pm or by appointment
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Text	Mathematical Statistics with Applications, 8 th Edition, Pearson Irwin Miller & Marylees Miller ISBN 978-1-29202-500-1

Class-related information and materials including solutions for homework and exam will be announced in class.

Course Description:

Mathematical statistics is a recognized branch of mathematics, and the theory of statistics is applied to engineering, physics and astronomy, quality assurance and reliability, drug development, public health and medicine, the design of agricultural or industrial experiments, experimental psychology, and so forth. Those wishing to participate in such applications or to develop new applications will do well to understand the mathematical theory of statistics. For only through such an understanding can the application proceed without the serious mistakes that sometimes occur. This course includes the following topics for such understanding: Probability distributions, Random variables, Point estimation and confidence intervals with their properties, Neyman Pearson lemma, likelihood ratio test, hypothesis testing, chi-squared test, linear model and least squares, analysis of variance.

Learning Outcomes:

1) Master the concept of probability especially:

* Probability densities;

- * Mathematical expectation;
- * Special probability distributions;

2) Master the concept of random variables with probability:

- * Function of random variables;
- * Sampling distribution;

3) Understand the concept of Central Limit Theorem and know to apply in practice.

4) Understand the estimation, especially:

- * Point estimation and confidence interval estimation for the proportion, mean and variance;
- * estimation on one proportion;
- * estimation on the difference between two proportions;
- * estimation on one population mean when the population is normal;
- * estimation on the difference between two population mean when the populations are normal;
- * estimation on one population variance when the population is normal;
- * estimation on the ratio of two population variances when the populations are normal;

5) Understand the hypothesis testing, especially:

- * hypothesis testing for the proportion, mean and variance
- * hypothesis testing on one proportion;
- * hypothesis testing on the difference between two proportions;
- * hypothesis testing on one population mean when the population is normal;
- * hypothesis testing on the difference between two population mean when the populations are normal;
- * hypothesis testing on one population variance when the population is normal;
- * hypothesis testing on the ratio of two population variances when the populations are normal;

6) Demonstrate skills for linear regression with;

- * least squares estimation.
- * Parameter estimation and testing
- * Analysis of variance
- * Prediction using the fitted regression model

Grades:

Homework – 10%

Midterm 1,2 – 25% each

Final – 40%

Homework:

Assignments will be given in class and each student must turn in the homework on the due date. Late homework will not be accepted. Solutions will be posted on the webpage after the due date. The first page of the homework should contain the following information:

AMS 412, Homework #, (Your name)

All exams are closed-book tests. You may bring a calculator.

Lectures:

Lecture notes will be available to be downloaded from Blackboard. It would be a good idea to print the notes and bring them to the class.

Academic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

School Policy on Attendance:

1. If a student has over 20% unexcused absences, the student's final course grade will be an F.
2. Students should report the reason for absence to the professor in advance, or immediately after the absence.

3. When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the professor.
4. The professor of the course reserves the right to excuse absences.
5. The professor may excuse the absence if the submitted documentation fulfills the following conditions: extreme emergencies, severe medical reasons with doctor's note, very important events.

Tentative Course Schedule

Week	Method & Dates	Chapter	Topic
1	TBA 8/29, 8/31	Chapter 1-3	Introduction, Probability, Probability Distributions and Probability Densities
2	TBA 9/5, 9/7	Chapter 4	Mathematical Expectation
3	TBA 9/12 9/14		Break (Chuseok)
		Chapter 5-6	Special Probability Distributions, Special Probability Densities
4	TBA 9/19, 9/21	Chapter 5-6	Special Probability Distributions, Special Probability Densities
5	TBA 9/26, 9/28	Chapter 7 Chapter 8	Functions of Random Variables Sampling Distributions
6	TBA 10/4, 10/5		Review Midterm #1
7	TBA 10/10 10/12		Break (Substitute of Hangul Day)
		Chapter 10	Point Estimation
8	TBA 10/17, 10/19	Chapter 10	Point Estimation (unbiasedness, efficiency, consistency, sufficiency)
9	TBA 10/24, 10/26	Chapter 10	Point Estimation (method of moments, method of maximum likelihood, Bayesian estimation)

10	TBA 10/31, 11/2	Chapter 11	Interval Estimation (means, differences between means, proportions)
11	TBA 11/7 11/9	Chapter 11	Interval Estimation (difference between proportions, variances, ratio of variances) Review
12	TBA 11/14 11/16	Chapter 12	Midterm #2 Hypothesis Testing (Neyman-Pearson Lemma, power of tests, Likelihood Ratio Test)
13	TBA 11/21 11/23	Chapter 13	Hypothesis Testing involving Means, Variances, and Proportions
14	TBA 11/28, 11/30	Chapter 14	Regression and Correlation (least squares method)
15	TBA 12/5,12/7		Bayesian Estimation, Analysis of Variance, Supplements, and Review