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# Mathematical Statistics

DE-7600044, FALL 2023

Engineering Building 207–10515, Mon/Wed 15:00–16:30

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- Instructor** Chanseok Park (e-mail: CP<AT>PUSAN<DOT>AC<DOT>KR)  
OFFICE: Engineering Building 207–10527  
OFFICE HOURS: 12:00–13:00pm (Mon/Wed) or by appointment.
- Textbook** *Probability and Statistical Inference* by Hogg, Tanis, and Zimmerman.  
Pearson, 9th edition (2014).
- Web Page** <https://AppliedStat.GitHub.io/class>
- Software** *R Language* (<http://www.r-project.org>).  
*Maple* (<http://www.maplesoft.com>).
- Prerequisite** Undergraduate-level statistics course is required. (The expectation is that you have already been exposed to the basic probability and statistics).
- Policy**
- Attendance Policy: Class attendance is mandatory. If you miss a class for some reason, it is your responsibility to get notes, *etc.* from someone in the class. I will not repeat lectures during my office hours.
  - Tardy Professor Policy: If the instructor has not arrived within 15 minutes of the scheduled class time, you may assume that class has been canceled.
  - All drop/add procedures are your responsibility.

## Description and Learning Objectives

- Mathematical Statistics will focus on the theories of statistics.
- First Topics (probability part) covered in this class include basic distribution theories and various probability distributions such as binomial, negative binomial, Poisson, exponential, normal, bivariate, etc.
- Second Topics (statistics part) covered in this class include point estimation, interval estimation, sampling, linear regression, and statistical hypothesis testing.
- We will also study various statistical applications widely used for engineering. The popular R statistical language or Rstudio will be handled in this class.

Upon successful completion of this course, a student will be able to:

- Understand basic concepts on probability theories.
- Obtain basics on discrete and continuous distributions.
- Obtain conditional distributions.
- Obtain bivariate distributions.
- Obtain various approximation technique.
- Understand basic concepts on statistics theories.
- Obtain point estimates.
- Obtain interval estimates.
- Understand basic sampling techniques.
- Obtain a simple linear regression estimate.
- Construct various statistical hypothesis testing.
- Learn how to program basic statistical programs using R language.

## Grading

The final grade will be curved and calculated as follows:

HOMEWORKS:	5%
ATTENDANCE:	5%
MIDTERM	45%
FINAL:	45%

ROUGH GRADING GUIDE:

- A+: 95 ~ 100      A: 90 ~ 95-
- B+: 85 ~ 90-      B: 80 ~ 85-
- C+: 70 ~ 80-      C: 60 ~ 70-
- D+: 50 ~ 60-      D: 40 ~ 50-
- F : below 40.

## Exams

MIDTERM: T.B.A      In class

FINAL:      T.B.A

- The mid-term exam is a closed-book test, but the final is an open-textbook test.  
**Note: for the final, only textbook is allowed. No handout or printout is allowed.**
- The final exam will be comprehensive.
- During the exams, a basic calculator will be permitted but cannot be shared with others.
- Calculators in smart phones, tablet PC and laptops are prohibited.
- No early or late exams will be allowed without a written and legitimate excuse.

## Homeworks

- The students can collaborate on their homework problems, but they should submit their homeworks separately.
- Late homeworks will **not** be accepted.
- Up to 1 ~ 2 problems, selected at random, will be graded in detail, on a scale of 0–5 each.
- To get full credit, you must show all work on the homework problems, which must be handed in in the same order as they are assigned.

## Tentative Schedules

- 1 Reviews on Engineering probability theories.
- 2 Distributions with several random variables.
- 3 The central limit theorem.
- 4 Introduction to point estimation.
- 5 Descriptive statistics.
- 6 Order statistics.
- 7 MLE (Maximum Likelihood Estimation).
- 8 Simple regression model
- 9 Introduction to confidence interval.
- 10 Confidence interval for means.
- 11 Confidence interval for the difference of two means.
- 12 Confidence interval for proportions.
- 13 Introduction to statistical hypothesis test.
- 14 Statistical hypothesis test about one or two means.
- 15 Statistical hypothesis test about proportions.
- 16 Final Exam