

Statistical Methods for Engineers and Applied Scientists

STAT/CSE 4340, EMIS 3340

January 2017

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Class meets: January 9th through January 18th, 9 am - noon and 1 - 4 pm

Classroom: TBD

Web Support: Canvas

Course Description

Basic concepts of probability and statistics useful in the solution of engineering and applied science problems. Topics include probability, probability distributions, data analysis, sampling distributions, estimation and simple tests of hypothesis. *Prerequisites:* MATH 1337 and 1338.

Learning Objectives

To become familiar with the basic rules of probability, statistical independence and conditional probabilities, discrete and continuous probability models and corresponding distributions, joint probability distributions, correlation and covariance, distribution of the sample mean and its relation to the Central Limit Theorem, and beginning statistical inference such as point estimation, confidence intervals, and hypothesis tests.

Student Learning Outcomes

Students will be able to understand and apply the following: simple probability rules including conditional probability and Bayes theorem, main families of distributions such as normal, exponential, binomial, Poisson, basic statistical inference such as point estimation, confidence intervals and hypothesis tests.

Detailed (but tentative) outline of activities

Additional course work prior to the start of the term includes a reading assignment (material and articles will be provided via Canvas) and a review – Assignment 1 (for elementary knowledge of statistics, probability, and calculus) with tentative due dates 12/22/16 and 01/06/17 to ensure feasibility of covering all necessary topics and make it possible to include a field trip to Los Alamos National lab into the schedule.

1. Monday January 9th

- (9-noon) – Working with data. Descriptive statistics. Graphical display of data.
- (1-4) – Introduction to probability. Sample spaces, probability rules, independence, conditional probability, Bayes Theorem.

- Homework– Assignment 2.
2. Tuesday January 10th
 - (9-noon) – Random variables and probability distributions. Discrete distributions, continuous distributions, joint distributions, basic rules of independence, conditional distributions.
 - (1-4) – Expectation and variance, effect of independence, covariance, and correlation.
 - Homework – Assignment 3.
 3. Wednesday January 11th
 - (9-noon) – Discrete random variables and several well-known discrete probability distributions: binomial, multinomial, geometric, negative binomial, and Poisson.
 - (1-4) – Continuous random variables and several well-known continuous probability distributions: uniform, normal, gamma, exponential, chi-square.
 - Homework – Assignment 4.
 4. Thursday January 12th
 - (8-10) – (Cont.) Continuous random variables and several well-known continuous probability distributions: uniform, normal, gamma, exponential, chi-square.
 - (11-6)– Field trip to Los Alamos National Lab/Bradbury Museum of Science (tentative)
 - Homework – Assignment 5.
 5. Friday January 13th
 - (9-noon) – Transformations of random variables.
 - (1-4) – Sampling distributions, t-distribution, Central Limit Theorem, repeated sampling principle.
 - Homework – Assignment 6 and Assignment 7.
 6. Monday January 16th
 - (9-noon) – Point estimation. Methods of moments, examples of normal, exponential, binomial, and Poisson.
 - (1-4) – One- and Two-Sample confidence intervals, for means, proportions, motivated by CLT.
 - Homework – Assignment 8.
 7. Tuesday January 17th
 - (9-noon) – (Cont.) One- and Two-Sample confidence intervals, for means, proportions, motivated by CLT.
 - (1-4) – One- and Two-Sample Tests of Hypotheses.
 - Homework – Assignment 9.
 8. Wednesday January 18th
 - Review and Comprehensive final exam.

Course Readings

In addition to the required text, class notes will be provided for your reference. I use some resources below as assigned readings or activities in class/homework. For the most part my slides/notes and solving problems in class should be most valued resource when completing assignments (assuming you take notes in class and ask questions).

- Texts: Devore, J.L. Probability and Statistics for engineering and the sciences, Ninth edition.
- Other references (will be available in the SMU-in-Taos library during the term):
 1. Walpole, Myers, Myers, and Ye. Probability and Statistics for Engineers and Scientists, 9th edition. Pearson.
 2. Kalbfleisch, J.G. Probability and Statistical Inference, Volumes 1 and 2. Springer-Verlag.
 3. Feller, W. An introduction to probability theory and its applications. Volume 1. Wiley.
 4. Hayter, A. Probability and Statistics for Engineers and Scientists. 4th edition. Brooks/Cole Cengage Learning.

Method of Evaluation

Your course grade will be based on 10 homework assignments (60%), class quizzes (20%) and a final exam (20%).

- Each homework is assigned at the end of each class and is due before the next class starts. Late homework receives a score of 0. Partial credit is given for submitted on time but not finished homework. Be neat - If I cannot read your handwriting, I cannot give you a credit for the problem.
- You will need a calculator for the exams. Laptop computers may not be accessed during an exam and a cell phone may not be used as a calculator.

Academic Honesty

By choosing to join the SMU community, you have agreed to abide by the policies and procedures of the University. One of these responsibilities is the Honor Code. Violations of the Honor Code include, but are not limited to the following:

1. Cheating: using or attempting to use unauthorized materials, information, or study aids in any academic exercise
2. Plagiarism: representing the words, ideas, or data of another as ones own in any academic exercise.
3. Fabrication: unauthorized falsification or invention of any information or citation in an academic exercise.
4. Aiding and Abetting Dishonesty: intentionally or knowingly helping or attempting to help another student commit an act of academic dishonesty Students are expected to take exams without outside assistance. The work in this course is to be an individual exercise, and will be evaluated as such.

Any collaboration on homework assignments, projects, or exams, except where specifically noted, is considered an honor violation. Any and all suspected violations of the Honor Code will be referred to the Honor Council.

Students who violate University rules on academic dishonesty (the SMU Honor Code) are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on academic dishonesty will be strictly enforced. For further information, please visit The Honor Council of Southern Methodist University.

Special Accommodations

1. **Disability Accommodations:** Students needing academic accommodations for a disability must first be registered with Disability Accommodations & Success Strategies (DASS) to verify the disability and to establish eligibility for accommodations. Students may call 214-768-1470 or visit Disability Accommodations & Success Strategies to begin the process. Once registered, students should then schedule an appointment with the professor to make appropriate arrangements. (See University Policy No. 2.4; an attachment in the Appendix describes the DASS procedures and the location of the office.)
2. **Religious Observance:** Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. See University Policy No. 1.9 and the Major Religious Holidays section on the
3. **Excused Absences for University Extracurricular Activities:** Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. See the Excused Absences for University Extracurricular Activities section on the Undergraduate Catalogue.