IAM 530 (3-0) 3
COURSE OUTLINE

ELEMENTS OF PROBABILITY AND STATISTICS

INSTRUCTOR: Ceylan YOZGATLIGİL, Ph.D.

OBJECTIVES

The goal of this course is to introduce students to the basic probability theory and mathematical statistics and help them in establishing a good theoretical background for their future professions. This course provides a comprehensive introduction to probability, statistical theory and methodology. Lectures will explain the theoretical origins and practical implications of statistical formulae. This course contains the most basic tools for a good initiation to statistical methods in Applied Mathematics.

PREREQUISITE

Consent of the instructor

TOPICS

Week 1 Introduction: Probability Axioms, Combinatorics.
Week 2 Conditional Probability, Bayes Theorem.
Week 3&4&5 Random variables, probability mass function, probability density function, cumulative distribution function and their properties. Expectations of random variables, Transformations of variables, Parameter, Statistics, Measure of location, measure of variability, Box-Plot graphs, Covariance and Correlation.
Week 6&7 Moment generating functions, Statistical Distributions: Discrete distributions and their properties, Continuous distributions and their properties.
Week 8 Limiting Distributions
Week 8 Sampling Distributions
Week 9&10&11 Point Estimation: Maximum likelihood estimation, Method of moments. Unbiased estimators, Consistent estimators, Mean-square error, Sufficiency; Completeness, Rao-Blackwell Theorem, Complete sufficient statistics, Lehmann-Scheffe theorem, Minimum variance unbiased estimators, Exponential families, Fisher information, Rao-Cramer inequality, Efficient estimators, Asymptotic efficiency.
Week 12&13 Estimation II: Testing hypotheses: concepts of hypothesis testing, Neyman-Pearson lemma, Likelihood ratio test, Confidence intervals
Week 13 Distribution Fitting
Week 14 Simple Linear Regression

TEXT

- Introduction to Probability and Mathematical Statistics, 2nd edition.
  Bain and Engelhardt, 1992

REFERENCES

- Statistical Inference. Second Edition.
  Casella, G. and Berger, R.L., Thomson Learning, 2002
- Mathematical Statistics with Applications,
  Wackerly, D.D., Mendelhall, W.III and Scheaffer, R.L., 7th ed.,
  Thomson, 2008.
- Probability and Statistical Inference,
  Hogg, R. V. and Tanis, E. A., Prentice Hall, 2006
-Introduction to Probability and Statistical Inference,
  Roussas, G.G., Academic Press. (2003)
-Introduction to Probability and Statistics.
  Milton, J. S. and Arnold, J. C., McGraw-Hill, 1995.
-Introduction to Mathematical Statistics, 6^{th} edition,
  Hogg, McKean and Craig, Prentice Hall, 2005.
-John E. Freund's Mathematical Statistics with Applications, 7^{th} edition,
  Miller, I. and Miller, M., Prentice Hall, 2004.
-Mathematical Statistics, 2^{nd} edition,
  Bickel, P.J. and Doksum, K. A., Prentice Hall, 2001.
-An Introduction to Mathematical Statistics and Its Applications, 4^{th} ed.,
  Larsen, R. J. and Marx, M. L., Prentice Hall, 2005.

ATTENDANCE

Mandatory, though I will not take roll. You are responsible for everything we do in class, even on days you do not attend.

GRADING

Midterm exam (35%)
Homework (30%)
Final (35%)

MAKE-UP EXAM

Make-up exams will only be given in **very unusual circumstances**, with one week prior notification (or, in the event of an emergency, ***very* strong documentation** of that emergency). If you have this kind situation and don't **contact with me one week before or after the exam**, you **cannot** take the make-up exam. Make-up exam will be given at the **end of the semester** and it will be **similar to the final exam** (cover all the topics).

LATE HOMEWORKS

Homework is collected in the lecture hours. Your homework will not be graded, if you bring it after the lecture.

ACADEMIC INTEGRITY

All assignments and exams must be done on your own. Note that academic dishonesty includes not only cheating, fabrication, and plagiarism, but also includes helping other students commit acts of academic dishonesty by allowing them to obtain copies of your work. You are allowed to use the Web for reference purposes, but you may not copy code from any website or any other source. In short, all submitted work must be your own. Should a student be caught cheating during an examination or be involved in plagiarism, a zero (0) will be assigned for the exam, quiz or writing assignment.

Please look at the following page for further information:
http://www.ueam.metu.edu.tr/TURKCE/ueam/ueam_ilkeler/ueam_ilkeler_honor_code_tab.htm