CSE 2400 Applied Statistics

2011–2012 Catalog Data: CSE 2400 Applied Statistics (3 credits). Includes probability and sample space concepts, discrete and continuous random variables, moments of random variables, covariance, correlation, generating functions, conditional probability, independence, introduction to statistics, confidence intervals, hypothesis tests, chi-square tests, linear regression and non-linear regression. Prerequisites: MTH 1002.

Required

Prerequisites by Topic: Integral and differential calculus

Textbook (T) and References (R):

D. Montgomery, Applied Statistics & Probability for Engineers. John Wiley & Sons, 2010. (T)

Course Outcomes & Related Student Outcomes: The student will be able to

1. Understand the concepts of probability, events, and sample space and solve basic problems involving these in discrete and continuous settings. (1: Fundamental knowledge)
2. Understand the concepts of probability mass function, probability density function, and cumulative distribution function of a random variable. Use these as appropriate in problem solving. (1: Fundamental knowledge)
3. Understand population or distribution parameters including mean, variance, and standard deviation (plus other well-known parameters such as those used in exponential, gamma, and chi-square distributions). (1: Fundamental knowledge)
4. Recognize/use the most important distributions for discrete random variables plus their means and variances. These include Bernoulli, binomial, geometric, discrete, uniform, and Poisson. (1: Fundamental knowledge)
5. Recognize/use the most important distributions for continuous random variables plus their means and variances. These include continuous uniform, exponential, gamma, normal, chi-square, Student-t, F distributions. (2: Scientific, computational, and engineering problem solving)
6. Use sample statistics to estimate population parameters and develop appropriate confidence intervals for the purpose. Understand hypothesis testing and the ideas of type I and type II errors. Perform hypothesis testing for means and variances. (2: Scientific, computational, and engineering problem solving)
7. Understand the central limit theorem and its role in sample mean tests. Know when to use normal and Student-t tests in this connection. (2: Scientific, computational, and engineering problem solving)
8. Understand the idea of generating values of random variables that have a given distribution (as appropriate for Monte Carlo simulations). (2: Scientific, computational, and engineering problem solving)

9. Perform an analysis of variance to test for differences among multiple treatment means. Perform a linear regression and an associated analysis of variance. Develop confidence intervals appropriate to linear regression. (2: Scientific, computational, and engineering problem solving)

Topics Covered and Associated Time:

1. Probability space (3 hours)
2. Discrete probability (3 hours)
3. Continuous probability (3 hours)
4. Moments of random variables (3 hours)
5. Central limit theorem (2 hours)
6. Multivariate (joint) distributions (2 hours)
7. Covariance and correlation (2 hours)
8. Probability generating functions (2 hours)
9. Population mean, variance, confidence intervals (2 hours)
10. Hypothesis testing (1 hour)
11. Descriptive statistics (1 hour)
12. Test of sample means (1 hour)
13. Chi-square goodness of fit (1 hour)
14. Empirical distributions (1 hour)
15. Analysis of variance (2 hours)
16. Linear regression (3 hours)
17. Non-linear regression (1 hour)

Schedule:

Offered in Fall & Spring semesters

Three 50-minute instructor-lead lectures per week

Prepared By: Gerald Marin, Ph.D., Professor

Signature: _____ **Date:** June 26, 2012