WASHINGTON STATE UNIVERSITY
VANCOUVER
World Class. Face to Face.

School of Engineering and Computer Science

Stat/Math 360: Probability and Statistics

Catalog Data:	**MATH 360 Probability and Statistics**; 3 credits Probability models, sample spaces, random variables, distributions, moments, comparative experiments, tests, correlation, and regression in engineering applications.
Class Schedule:	Three 50-minute lecture sessions per week, for one semester.
Laboratory Schedule:	One 75-minute lab session every three weeks, for one semester.
Prerequisites by Course:	Math 172
Prerequisites by Topic:	Basic mathematics and calculus
Required Texts:	Vining, G. Geoffrey, and Kowalski, Scott, *Statistical Methods for Engineers*, Second Edition, 2006, Duxbury Publications.
Reference (s)	DeVore, Jay, L. and Farnum, Nicholas, R. *Applied Statistics for Engineers and Scientists*, Second Edition, 2005, Duxbury Publications. Levine, Davis. M., Ramsey, Patricia, P., and Smidt, Robert, K. *Applied Statistics for Engineers and Scientists Using Microsoft Excel & Minitab*, 2001 Prentice-Hall Publications Company.
Course Coordinator:	Dr. Hamid Rad
Course Objectives:	1. Applying probability to sampling, simulation, and the design of engineering experiments. 2. Illustrating how engineers and scientists develop models of processes and make use of them. 3. Making students familiar with the broader use of statistics in engineering, econometrics, biological and social sciences, and public policy. 4. Explaining the essence of inference and inversion.
Topics Covered:	1. Nature of Probability and Statistics, statistical methods in engineering, statistical thinking, and structured problem solving models. Obtaining data and sampling, Basic Principles of experimental design with examples, and purpose of engineering statistics. 2. Data displays and organization such as Frequency distributions, Graphic presentation, Stem-and-Leaf Displays, Boxplots. Use of computer software in data display. 3. Data description, Mean, Median, Range, Variance, Standard Deviation, and Counting techniques. 4. Probability, Sample Spaces, Addition Rule, Multiplication Rule, Conditional Probability, Complement Events, Probability and Counting Techniques. 5. Random variables and distributions, Probability distributions, Discrete and continuous random variables, Normal distribution, and Random behavior of means. Random behavior of means when the variance is unknown. Normal approximation to the binomial distribution. 6. Estimation, Hypothesis testing, Inference for a single mean and proportions, Inference for two independent samples, and Hypothesis testing. The paired t-test and inference for variances. Test for proportions, Confidence intervals, Point estimates, and sample size for a given tolerance.

	7. Introduction to control charts, specifications limits and capability, X and R Charts, X and s-squared Charts, X-Chart, the NP-Chart, the C-Chart, average run lengths, standard control charts with runs rules, and cost estimating issues. 8. Linear regression analysis, relationships among data, simple linear regression, multiple linear regression, and residual analysis. 9. Introduction to analysis of variance (ANOVA), 2-to the k power factorial based experiments, and the 2-squared Factorial Design.		
Lab Experiments and Activities:	1. Use of Microsoft Excel to analyze data. Use of Excel Establishing data distribution such as charts, graphs to interpret the data. 2. Calculations of mean, median, standard deviation and variance of sample data. 3. Probability analysis such as Binomial, Normal, and Poisson's Distributions. 4. Z-distribution and Z-test, F-distribution and F-test, Chi-distributions and Chi-test using Microsoft Excel.		
Course Outcomes:	Students will be able to: A-1. Use the concepts of probability and statistics to formulate and solve problems and communicate their results to others. A-2. Choose appropriate mathematical models such as student's *t-test* and *F-test* to analyze sample data to interpret and draw conclusions for population data. A-5. Demonstrate the knowledge and principles of probability and statistics to represent quantitative information by means of appropriate graphing techniques. A-6. Apply the statistical methods to read and interpret graphical and numerical data and to understand and appreciate the connections between statistics and real-life problems in different disciplines. B-2. Use appropriate models, tests, apparatus to collect data. B-3. Use appropriate statistical tools such as Microsoft Excel to analyze data, interpret the data and draw conclusions based on the results. E-2. Examine alternatives using mathematical, scientific, and statistical knowledge to formulate solutions. E-3. Use analytical, computational and/or experimental methods such as Analysis of Variance (ANOVA) to obtain solutions. K-4. Use available technology such as statistical analysis software as an integral part of the process of formulation, solution and communication for data analysis.		
Required or Elective Course:	Required		
Contribution to Professional Component:	Engineering Topics		
Relationship of Course to Program:	Meets: Educational Objectives 1, 2 Program Outcomes A, B, E, K		
Prepared by:	Dr. Hamid Rad	Date:	November 1, 2006
Approved by CAC:			