Probability and/or Statistics Guidelines for Incoming Students

As you know, the Systems Engineering Program requires an undergraduate level Probability and Statistics prerequisite for students enrolling in the MEng program. We have identified the material that is a necessary prerequisite for our classes. This information is a guideline for the probability and statistics concepts that we feel every student should understand in order to be successful in our courses.

The key question in determining the suitability of your knowledge from having taken or planning to take a particular course is partially summed by the following quote from a report from the American Statistical Association (Guidelines for Assessment and Instruction in Statistics Education (GAISE)):

“Some people teach courses that are heavily slanted toward teaching students to become statistically literate and wise consumers of data; this is somewhat similar to an art appreciation course. Some teach courses more heavily slanted toward teaching students to become producers of statistical analyses; this is analogous to the studio art course.”

What you will need for Cornell Master of Engineering classes is the latter, analogous to the studio course.

Some classes offered at Cornell that we consider to offer the appropriate preparation are ENGRD2700 and CEE3040. For your reference, the items covered in ENGRD2700 are listed below. We also feel that the textbook: Devore, J., Probability and Statistics for Engineering and the Sciences (any edition) is at the level that is needed for our classes. Thus if you are getting ready to take our classes you might want to review that book to be sure that you feel comfortable with material at the appropriate level.

If you are interested in taking a suitable distance learning course, there are a number of these available from various universities, however, you should have the course approved in advance of completing it to be sure it will be approved. One DL course that we are familiar with and has proved satisfactory in the past is Math217 from Indiana University of Pennsylvania.

Cornell University ENGRD 2700 Basic Probability and Statistics for Engineers

Contents

1 Introduction and Motivation
   Intro, What the course is about, Overview

2 Exploratory Data Analysis: Describing Sample Data
   Graphical displays
   Numerical summaries

3 Counting and Probability
   Counting: Product rule, sampling with replacement, without, combs, practice problems
Probability: Elements, Events, Probability functions, specifying, properties, equal probs, hypergeometric

4  Conditional Probability, Bayes' Rule and Independence
   Cond Prob, Law of total prob, Bayes rule, independence

5  Random Variables
   Definition, Probability mass function, Cumulative distribution function, expectation, variance

6  Special Discrete Random Variables
   Bernoulli, binomial, Poisson, geometric, hypergeometric

7  Continuous Random Variables
   Density, cumulative distribution function, percentiles, expectation, variance,

8  Special Continuous Random Variables
   Uniform, exponential, Weibull, beta, gamma, normal, lognormal

9  Probability Plots

10 Multiple Random Variables
   Definition, independence, conditional distrib, more than two

11 Covariance and Correlation
   Expectation, covariance, correlation

12 Sampling Distributions
   Inference, sampling, sums and averages, CLT

13 Interval Estimation
   Confidence intervals for mean, for proportion, two indep samples, two props, paired samples, CIs for variance

14 Hypothesis Tests
   Normal means, Type I and II errors, relation to confidence intervals, two populations

15 Regression
   Simple linear
   confidence intervals and testing for beta_1

16 More Regression
   Transformation of vars
   Multiple linear
   Logistic regression

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