

### 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