**B9116 Math Methods**

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**Course overview:**

This is the first in a two-course sequence in probability and statistics. Topics will include basic probability theory, general characteristics of random variables, and collections of random variables, as well as elementary random processes. The intent is to develop an intuitive feel for the subject of probability and to enable to critically evaluate and construct probabilistic arguments.

 Required text: Wackerly/Mendenhall/Schaeffer, *Mathematical Statistics with Applications*,

7th ed., Duxbury Press, 2008.

 Supplementary text: N. Silver, *The Signal and the Noise: Why So Many Predictions Fail* *– But Some Don’t*, Penguin Press, New York, 2012.

**Articles (posted in Canvas):**

1. Chocolate consumption, cognitive function and Nobel laureates, *NE Journal of Medicine,* 2012.
2. The marrying kind: born or made? *New York Times,* 2011.
3. Take back your pregnancy, *Wall Street Journal,* August 10, 2013.
4. Gender diversity and corporate performance, *Credit Suisse Research Institute*, 2012.
5. Does marriage matter, *Demography* 32, 1995, pp. 483-507.
6. Why most published research findings are false, PLOS Medicine, 2005.

**Preparation for first class:**

Read articles (1) - (4); additional reading: introduction and chapters 1 and 2 of Nate Silver.

**Session Topics Readings**

 **(W=Wackerly; M=Meyer)**

1 Introduction to probability/statistics W 2.1-2.6

2 Conditional probability W 2.7-2.10

3 Bayes Theorem; Bayesian analysis

4 One-dimensional random variables W 2.11, 3.1, 3.2, 4.1, 4.2

5 Some discrete distributions: binomial, geometric, W 3.4, 3.5, 3.7, 3.8

 hypergeometric, Poisson

6 Some continuous distributions: uniform, W 4.4-4.6

 exponential, gamma, normal

7 Functions of random variables; expectation and W 6.2-6.4, 3.3, 4.3, 4.11

 variance

8 Two- and higher-dimensional random variables W 5.1-5.6

9 Moment generating functions W 3.9, 6.5

10 Sums of random variables; central limit theorem

11 Survivor and hazard W 3.11, 4.10, 7.3, 7.5,

 functions and M 11.1-11.4

**Assignments**

Homework will be assigned regularly but will not be collected. The course grade will be determined by the midterm and final exams. **Midterm = 40%. Final = 60%.**