**B9116 Math Methods Fall 2019**

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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: H.Tijms, Understanding Probability 3rd ed, Cambridge University Press

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**

1 Introduction to probability/statistics 2.1-2.2,

2 Conditional probability ch 7

3 Bayes Theorem; Bayesian analysis 8.1,8.2

4 One-dimensional random variables 9.1, 9.2,9.6

5 Some discrete distributions: binomial, geometric, ch 4

hypergeometric, Poisson

6 Some continuous distributions: uniform, 10.1, 10.2 10.4

exponential, gamma, normal

7 Functions of random variables; expectation and 9.4,10.3,10.5

variance

8/9 Two- and higher-dimensional random variables 11.1, 11,2,11.3, 11.5

10 Moment generating functions 14.2, 14.3

11 Sums of random variables; central limit theorem 9.5,11.2, 5.4, 5.5, 5.6

**Homework sets:**

Set 1: odd numbered problems from 7.1-7.19

Set 2: posted on canvas

Set 3: odd numbered problems 8.1-8.29

Set 4: odd numbered problems from 9.1-9.13

Set 5: odd numbered problems from 4.1-4.19

Set 6: odd numbered problems 10.1-10.16.,10,27-10.39

Set 7: 9.19,9.21,9.23, odd numbered problems from 10.17 to 10.25

Set 8: odd numbered problems from 11.1 to 11.15

Set 9: 14.12, 14.13, 14.14,14.17

Set 10: 9.25, 9.27, 9.29

**Assignments**

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