ENG EK 500: Probability with Statistical Applications

Prerequisites:

Elementary linear algebra and differential equations. A course on elementary probability theory would help, but is not required. May not be taken for credit in addition to BE 200, EC 381, ME 308, or ME 366.

Meeting Time and Location:

Tuesdays & Thursdays 2:00 - 4:00 p.m. in SOC B61

Instructor Information:

Professor Perkins
Office: 15 St. Mary's Street, Room 146
Phone: 353-4991
Email: perkins@bu.edu

Office Hours:

Tuesdays & Thursdays 12:15 - 1:15 p.m. and by appointment

Course Web Site:

people.bu.edu/perkins/EK500

Required Textbook:

"Probability, Random Variables, and Stochastic Processes," A. Papoulis, McGraw-Hill.

Course Assignments:

Problem Sets: 30%

Midterm Exam: 30%

Second Exam: 30%

Attendance/Participation: 10%

Course Objectives:

(a) Develop a solid foundation in probability theory and random processes.

(b) Learn fundamental modeling and analysis techniques for stochastic systems so you can use them in applications found in various Engineering disciplines, Operations Research, Management, and Computer Science.

(c) Develop the ability to read technical journals and learn more advanced material based on random processes.

ENG EK 500: Course Outline

1. FOUNDATIONS OF PROBABILITY THEORY

- Basic concepts (sample space, event space, probability space)
- Probability measures and probability functions
- Discrete and continuous probability spaces
- Dependent and independent events, conditional probability

2. RANDOM VARIABLES

- Definitions
- Probability distribution and density functions
- Functions of random variables
- Expectation, moments, characteristic functions
- Sequences of random variables, convergence, laws of large numbers and central limit theorem

3. RANDOM PROCESSES

- Definitions
- Random process properties (stationarity, ergodicity, correlation)
- Spectral analysis, random process transformations
- Special random processes used in modeling: Gaussian, Poisson, Markov; applications
- Introduction to Estimation

ADDITIONAL REFERENCES

Consult the bibliographies in the textbook, especially books by Davenport and Root, Drake, Feller, Parzen, and Wong.
Some suggestions depending on your interests:

- If you are need a refresher on basic probability theory:

  Clarke, A. B., and Disney, R. L., Probability and Random Processes, Wiley, 1985.

- If you are interested in performance evaluation, discrete event systems, computer simulation, computer engineering applications:

  Cassandras, C.G., and Lafortune, S., Introduction to Discrete Event Systems, Springer, 1999.

  Law, A.M., and Kelton, W.D., Simulation Modeling and Analysis, McGraw-Hill, New York, 1991.

  Trivedi, K.S., Probability and Statistics with Reliability, Queuing and Computer Science Applications, Prentice-Hall, 1982.

- If you are interested in signal processing and communication applications:

  Helstrom, C.W., Statistical Theory of Signal Detection, Pergamon Press, 1968.

  Schwartz, M., and Shaw, L., Signal Processing, McGraw Hill, 1983.

  Proakis, J., Introduction to Digital Communications, McGraw Hill, 1983.

- If you are interested in more advanced theoretical material on random processes:

  Asmussen, S., Applied Probability and Queues, Wiley, 1987.

  Parzen, E., Stochastic Processes, Holden-Day, 1962.