Course Information Probability and Statistics for Mechanical Engineers ENG ME 366 Spring 2011

Course Description

Principles of probability and statistics including events, Bayes' theorem, random variables, joint and marginal distributions, random sequences and series, reliability theory, estimation, and quality control. Examples drawn from engineering applications. Cannot be taken for credit in addition to CAS MA 381, ENG BE 200, or ENG EC 381.

Course Outcomes

- 1. Acquire knowledge of introductory probability and statistics.
- 2. Develop an appreciation of the fact that lack of complete, deterministic knowledge about the state of a system does not mean lack of knowledge altogether.
- 3. Learn how to build probabilistic models that describe imperfect state information. And learn how to update these models as additional information is obtained.
- 4. Develop problem-solving approaches to learning and acquiring information through sampling.
- 5. Understand how redundancy of functional components of a system and the general system architecture affect system reliability.
- 6. Learn how to use collected data to construct a systematic description of process variability.
- 7. Acquire the ability to design diagnostic procedures to assist in the real-time description of the state of a system.

Prerequisites

ENG EK 127 and CAS MA 225

Lectures

Lectures are held in PSY B49 on Thursdays, 2:00PM - 4:00PM . There are a total of 14 lectures. You are strongly encouraged to ask questions during lecture and to offer answers to questions asked by the professor, even if you are not sure they are correct. Attendance will be taken at these lectures and used as one indicator of your level of effort. Ringers on cell phones should be turned off during lecture.

Instructor

- Professor J. Gregory McDaniel
- Email: jgm@bu.edu
- Office Location: Room 406 of 110 Cummington Street
- Office Phone Number: 617.353.4847
- Home Phone Number: 781.861.0202
- Office Hours: Mondays 10:30–12 a.m. or by appointment. To arrange an appointment, email at least two suggested times and a summary of your questions.

Teaching Fellow

- Tom Siedl
- Email: tseidl@bu.edu
- Office Location: TBA
- Office Hours: TBA

Course Materials

• Required Text: *Applied Statistics and Probability for Engineers, Fifth Edition*, Douglas C. Montgomery and George C. Runger, ISBN-13 978-0-470-05304-1.

• You must have a WileyPLUS account, which comes with a new book. The account can also be purchased, see wileyplus.com. You register for the account at: http://edugen.wiley.com/edugen/class/cls210059/.

Grading

Your final course grade is calculated according to the following distribution:

- Homework: 40%
- Midterm Examination: 30%
- Final Examination: 30%

Homework

Homework will be assigned through your WileyPLUS account.

Midterm Examination

The midterm examination will be given in class on Thursday, 3/10/11.

Final Examination

The final examination is tentatively scheduled for Thursday, 5/12/11, from 9:00 a.m. - 11:00 a.m. Early examinations will not be given.

Missed Examinations

Here is the policy regarding a missed examination:

- If you know ahead of time that you will miss the examination, you must notify the instructor in writing and describe your reason for missing the examination. If the instructor determines that the reason is appropriate, you will be given a makeup at a different time.
- If you do not know ahead of time that you will miss the event, you must notify the instructor in writing as soon as possible after the examination and describe your reason for missing the examination. If the instructor determines that the reason is appropriate, you will be given a makeup at a different time.
- The following reasons are not appropriate: oversleeping, working on an assignment for another course, design meetings, travel for pleasure.

Withdrawals, Drops, and Incompletes

Please see the important dates listing from the University Registrar. These will be strictly enforced. Incompletes will be permitted only for extenuating circumstances and they must be arranged before the final examination.

Syllabus Probability and Statistics for Mechanical Engineers ENG ME 366 Spring 2011

- The role of statistics in engineering
 - The engineering method and statistical thinking
 - Collecting engineering data
 - Mechanistic and empirical models
 - Probability and probability models
- Probability
 - Samples spaces and events
 - Interpretations and axioms of probability
 - Addition rules
 - Conditional probability
 - Multiplication and total probability rules
 - Independence
 - Bayes' Theorem
 - Random variables
- Discrete random variables and probability distributions
 - Discrete random variables
 - Probability distributions and probability mass functions
 - Cumulative distribution functions
 - Mean and variance of a discrete random variable
 - Discrete uniform distribution

- Binomial distribution
- Geometric and negative binomial distributions
- Hypergeometric distribution
- Poisson distribution
- Continuous random variables and probability distributions
 - Continuous random variables
 - Probability distributions and probability density functions
 - Cumulative distribution functions
 - Mean and variance of a continuous random variable
 - Continuous uniform distribution
 - Normal distribution
 - Normal approximation to the Binomial and Poisson distributions
 - Exponential distribution
 - Erlang and Gamma distributions
 - Weibull distribution
 - Lognormal distribution
 - Beta distribution
- Joint probability distributions
 - Two or more random variables
 - Covariance and correlation
 - Common joint distributions
 - Linear functions of random variables
 - General functions of random variables
- Descriptive Statistics
 - Numerical summaries of data
 - Stem-and-leaf diagrams
 - Frequency distributions and histograms
 - Box plots
 - Time sequence plots
 - Probability plots