Course Information

Course Name Probability and Statistics for Mechanical Engineers

Course Number ENG ME 366

Semester Spring 2015

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.

Learning Outcomes as follows:

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.

Prerequisite ENG EK 127 and CAS MA 225

Required Course Materials *Applied Statistics and Probability for Engineers*, Sixth Edition, Douglas C. Montgomery and George C. Runger.

Lectures Lectures are held in PHO 210 on Thursdays, 8:00AM - 10:00AM. Attendance will be taken. 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

Instructor Email `jgm@bu.edu`

Instructor Office Location Room 406, fourth floor of 110 Cummington Street

Instructor Phone 617.353.4847

Office Hours Tuesday 10 a.m.–12 a.m. or by appointment. To arrange an appointment, email at least two suggested times and a summary of your questions.

Course Average The numerical course average will be computed using the following distribution:

- Attendance: 10%
- Homework: 30%
- Midterm Examination: 30%
- Final Examination: 30%

Course Grade The letter grade for the course will be determined from the following chart:

Percent Range	**Letter Grade**
92.5–100	A
90.0–92.5	A-
87.5–90.0	B+
82.5–87.5	B
80.0–82.5	B-
77.5–80.0	C+
72.5–77.5	C
70.0–72.5	C-
60.0–70.0	D
50.0–60.0	F

Midterm Examination The midterm examination is scheduled for March 19, 2015.

Final Examination The final examination date and time are not available as of this writing. This information will be announced in class once it is available.

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

Syllabus

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Course Number ENG ME 366

Semester Spring 2015

- 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
  - Moment-generating functions
- Descriptive Statistics
  - Numerical summaries of data
  - Stem-and-leaf diagrams
  - Frequency distributions and histograms
  - Box plots
  - Time sequence plots
  - Scatter diagrams
  - Probability plots