<table>
<tr><td>COURSE NUMBER: IE 2011</td><td>COURSE TITLE: Probability and Statistics</td></tr>
<tr><td>TERMS OFFERED: Spring semester</td><td>PREREQUISITES: Math 1371, 1372 and 2374; Co-requisite Math 2373</td></tr>
<tr><td>TEXTBOOKS/REQUIRED MATERIAL:
Introduction to Probability Models, Ninth Edition, by Sheldon M. Ross, Academic Press, 2007

“IE 2020 Statistics Reader” (chapters 6-11 from “Applied Statistics and Probability for Engineers, Fifth Edition), by Douglas Montgomery and George Runger, Wiley and Sons, 2011</td><td>PREPARED BY:
Diwakar Gupta, John Carlsson, Kevin Leder

DATE OF PREPARATION:
November 7, 2011</td></tr>
<tr><td>COURSE LEADER(S):
Diwakar Gupta, John Carlsson, Kevin Leder</td><td>CLASS/LABORATORY SCHEDULE:
3-hour lecture & 1-hour tutorial per week for 13 weeks
CONTRIBUTION OF COURSE TO MEETING PROFESSIONAL OBJECTIVES:
100% engineering topics</td></tr>
<tr><td>CATALOG DESCRIPTION:
The course provides an introduction to elementary probability theory and statistics. It uses examples from fields such as engineering, computer science, management science, the physical and social sciences, and operations research to illustrate how concepts of probability and statistics can be used to address common problems arising in the uncertain world.</td><td>COURSE TOPICS:
Part I:
1. Random variables – discrete and continuous
2. Conditional probability & expectation
3. Markov chains
4. Exponential distribution & Poisson Processes
Part II:
1. Descriptive statistics, inferential statistics, and sampling.
2. Statistical parameter estimation, maximum likelihood estimation, confidence intervals.
3. Hypothesis testing and linear regression.
Part III:
1. Queueing theory</td></tr>
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COURSE OBJECTIVES 1. To help students build intuition and teach non measure-theoretic treatment of probability theory. 2. To introduce students to the concepts of probabilistic outcomes, random variables (discrete and continuous), moment generating functions, and stochastic processes. 3. To explore in-depth the concepts of conditional probability and conditional expectation. 4. To familiarize students with the concepts of Markov Chains and the Poisson process. 5. To introduce students to statistical techniques used in engineering in the presence of uncertainty and identifying and estimating the relevant parameters for making decisions. 6. To train students in proper methodologies for designing experiments and evaluating hypotheses. 7. To given students a basic understanding of queueing theory as an example of probability models. 8. To discuss various examples from engineering, business and the sciences where probability models can be used to address important problems.	
COURSE OUTCOMES 1. Students learn to model complex problems involving uncertainty 2. Students learn modeling methodologies – random variables, Markov chains, and queueing theory 3. Students will learn basic principles of design, monitoring, and control of production processes under uncertainty 4. Students will learn proper procedures for designing experiments, testing hypotheses, and drawing conclusions from observed results. 5. Students learn how to communicate their results in writing and orally to lay and engineering audience	
ASSESSMENT TOOLS: Assignments (6-7), Midterm exams (1-2), and final exam (1).	