

COURSE NUMBER: IE 4521, 4 credits	COURSE TITLE: Statistics, Quality and Reliability
TERMS OFFERED: Fall and Spring	PREREQUISITES: None. However proficiency in mathematics at the level of MATH 1261 is expected.
TEXTBOOKS/REQUIRED MATERIAL: Hayter, A. J. <i>Probability and Statistics for Engineers and Scientists</i> , 3rd Edition.	PREPARED BY: Professor Diwakar Gupta DATE OF PREPARATION: April 16, 2004 (Updated May 9, 2007 by Bill Cooper)
COURSE LEADER(S): Professor Diwakar Gupta, Professor Bill Cooper	CLASS/LABORATORY SCHEDULE: Two 115-minute lectures per week CONTRIBUTION OF COURSE TO MEETING PROFESSIONAL OBJECTIVES: 100% engineering topics
CATALOG DESCRIPTION: Random variables/probability distributions, statistical sampling and estimation, statistical inferencing, confidence intervals, hypothesis testing, single/ multivariate regression, analysis of variance and design of experiments, statistical quality control, quality management, reliability, availability.	COURSE TOPICS: <ol style="list-style-type: none"> 1. Random variables, laws of probability, discrete and continuous probability distributions, data presentation, analysis and interpretation. 2. Statistical estimation. Sampling distributions. Inferences on population mean and proportion, confidence interval estimation, hypothesis testing, single and two population comparisons. 3. Quality control charts, by variable and attribute. Process capability. Applications of SPC tools in product/process design. 4. Analysis of variance: simple and multiple linear regression, multi-factor experimental design. 5. Concepts of reliability, availability, and robustness.

COURSE OBJECTIVES	<ol style="list-style-type: none"> 1. To help students develop an understanding of how uncertainty is represented through probability distributions and of the various data analysis techniques. 2. To introduce students to statistical techniques used in engineering and sciences for decision-making in the presence of uncertainty and limited data. 3. To train students to construct control charts and implement statistical techniques for improving quality (e.g., through product and process design). 4. To train students in techniques used to evaluate reliability of systems, especially in the evaluation of various methods to increase availability/fault tolerance through design. 5. To help students develop an understanding of the various considerations in analysis of variance, regression, and experimental design. 6. To expose students to MINITAB – a leading software in statistical analysis.
COURSE OUTCOMES	<p>(Letters shown in brackets are linked to program outcomes a-k)</p> <ol style="list-style-type: none"> 1. Students learn to apply statistical tools to represent problems involving uncertainty, to analyze and interpret data, to design and perform experiments, and to make the right inferences from these experiments. They also learn to use data to infer trends and predict outcomes (regression analysis). [a, b, e, k] 2. Students learn basic principles of design, monitoring, and control of production processes to improve quality. [a, c, e, g, k] 3. Students learn to make conclusions based on statistical evidence and to communicate their findings in a scientific manner. [g]
ASSESSMENT TOOLS:	<ol style="list-style-type: none"> 1. Exams – 2 examinations during the term, and a final examination. 2. Assignments – 5 to 10 (frequency of assignments vary with instructor).

IE 4521

Nature of Changes

The only change made to the syllabus was to update the edition of the course textbook used.