

MeEn 372 Statistics for Engineers

An 'Elective' Course in Mechanical Engineering Program

2002 - 2004 Course Description: MeEn 372 - (Credit, 2 Hours) (Lecture, 3 hours). Presents an introduction to the utility of statistical tools and probability in engineering problem solving. Topics include descriptive statistics for one and two variables of measurement, basic probability, discrete and continuous probability distributions, linear and multiple regression and curve fitting, correlation, estimation, hypothesis testing, and analysis of variance. Applications from both manufacturing and process industries. **Prerequisite:** Consent of the instructor.

Textbook: *Probability & Statistics for Engineers & Scientists*, by R.E. Walpole, R.H. Myers, Keying Ye, 7th Edition, Prentice Hall, Inc., 2002.

Lecture: T Th 11.00 - 12:20 PM, in room 222 Pinchback Engineering Building

Course Coordinator:

Dr. Ravinder M. Diwan, Professor
Office Location: Room 357, Pinchback Engineering Bldg.
Office Phone: 225-771-2073
Office Hours: MWF 10-11 AM, M-F1-2 PM; TR 1- 3 PM
E-mail: diwan@enr.subr.edu

References:

1. *Engineering Statistics*, by D.C. Montgomery, G. C. Runger and N.F. Hubele, John Wiley & Sons, 1998.
2. *Statistics for Engineering and Sciences*, by W. Mendenhall and T. Sincich, 4th Edition, Prentice Hall, 1995.
3. *Elementary Statistics*, by Robert Johnson, Patricia Kuby, 8th Edition, Duxbury, Pacific Grove, CA, 2000.

Course Topics:

1. Introduction, data analysis, descriptive statistics. Chapter 1, assigned reference
2. Sample spaces, rules of probability and conditional probability. Chapter 2
3. Random variable and probability distribution concepts, joint probability distribution. Chapter 3
4. Means and variances of random variables. Chapter 4
5. Discrete probability distributions. Uniform, Binomial, and Multinomial distribution. Chapter 5
6. Continuous probability distributions. Normal, Poisson, and others. Chapter 6, sections, 6.1 - 6.8
7. Random sampling, central limit theorem, Chapter 8, section 8.4-8.7
8. Introduction to statistical inference. Chapter 9, sections 9.1-9.8
9. Statistical hypothesis testing, Chapter 10. Sections 10.1-10.5, Chi squared test of goodness of fit, sec. 10-14
10. Concepts of building empirical models, Least squares simple and multiple regressions, chapter 11, sections, 11.1 –11.4. Chapter 12.1-12.2
11. Introduction to special topics of tolerance and control charts, quality control and process control, analysis of variance, selected applications. Chapter 17

Prerequisite by Topics:

1. Logarithmic and exponential functions
2. Integrals and their applications
3. Sequences and Series
4. Analytical Geometry and Calculus

Course Objectives:

1. To develop a working knowledge of the role and techniques of descriptive statistics.
2. To learn the basic statistical techniques of data analysis including measures of location, and dispersion and box plot.
3. To develop the concepts and usefulness of applications of probability calculations, Models for discrete and continuous distributions, Binomial distribution, Poisson distribution, Normal distribution.
4. To analyze the concepts and applications of use of Normal error tables and Central limit theorem.
5. To develop understanding of hypothesis testing, and analysis of variance.
6. To analyze concepts of building empirical models with applications of linear and multiple regression and curve fitting, correlation, and selected applications from both manufacturing and process industries with concepts of industrial quality control.

COURSE ASSESSMENT:

Course Objective	Intended Educational Outcomes	Means of Assessment	Criteria of Success	Program Edu. Objectives/ ABET (a-k, Me1-Me6)
Objective 1: To develop a working knowledge of the role and techniques of descriptive statistics.	1.1 Students will demonstrate an understanding of the role of statistics in continuous quality improvement, introduction to descriptive statistics.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, and Me3
Objective 2: To learn the basic statistical techniques of data analysis including measures of location, and dispersion & box plot.	2.1 Ability to analyze experimental data using stem and leaf diagram, histograms, box plot and calculations of measures of location and dispersion.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, and Me3
Objective 3: To develop the concepts and usefulness of applications of probability calculations, Models for discrete and continuous distributions, Binomial distribution, Poisson distribution, Normal distribution.	3.1 Students will demonstrate an ability to analyze random variable characteristics using probability distribution function concepts. 3.2 Students will demonstrate the ability to analyze normal distribution, Binomial distribution, Poisson distribution, and exponential distribution. Solving for the probability values for given selected parametric conditions.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, and Me3
Objective 4: To analyze the concepts and applications of use of Normal error tables and Central limit theorem.	4.1 Students will be able to use Central limit theorem to random samples for probability calculations, and analysis of concepts of correlation and independence of two variables of measurement. Analysis of problems with use of Normal error tables.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, and Me3
Objective 5: To develop understanding of hypothesis testing, and analysis of variance.	5.1 Students will demonstrate an ability to analyze statistical hypothesis and type I and type II errors in decision-making. 5.2 Students will demonstrate an ability to do the analysis of inference procedure by use of Chi-squared test of goodness of fit.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, and Me3
Objective 6: To analyze concepts of building empirical models with applications of linear and multiple regression and curve fitting, correlation, and selected applications from both manufacturing and process industries with concepts of industrial quality control.	6.1 Students will demonstrate the ability to solve problems involving building of empirical models using simple linear regression and multiple linear regressions. 6.2 Students will demonstrate an understanding of quality control concepts and its applications, plotting and analyses of different types of quality control charts and concepts of process capability.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, and Me3

ABET Category Content (as estimated by faculty member who prepared this course description):

Engineering Science: 2.0 credits or 100%
Engineering Design: 0.0 credit or 0%

Prepared by: Ravinder M. Diwan

Date: 01/28/2003