### **ENG ME 518 Product Quality**

#### 2008-2009 Catalog Data:

**ENG ME 518 Product Quality** Prereq: ENG ME 308 or consent of instructor. Elements of quality control and design of experiments (DOE). Principles of sampling and use of statistics in quality control. Considerations of the quality of a product or system in the design stage. Vendor quality policy. 4 cr.

Class/Lab Schedule: 4 lecture hours per week

### Status in the Curriculum: Elective

**Textbook(s) and/or Other Required Material:** D.C. Montgomery *Introduction to Statistical Quality Control*, 4<sup>rd</sup> edition, Wiley, 2001. M. J. Anderson and P. J. Whitcomb, *DOE Simplified*, Productivity Inc., 2000.

**Reference:** J. M. Frank M. Gryna, *Quality Planning and Analysis*, 4th edition, McGraw-Hill, 2001.

J. Ross, Taguchi Techniques for Quality Engineering, 2nd edition McGraw-Hill. 1996.

Coordinator: Pirooz Vakili, Associate Professor, Mechanical Engineering

### **Prerequisites by topic:**

1. Knowledge of probability and statistics at the level taught in a typical undergraduate course.

#### Goals:

To introduce the modern view of the quality, its recent history, and its importance to industry in gaining and maintaining competitive advantage. To introduce the use of statistical methods for designing quality products and processes, controlling processes, and for improving products and processes. To give an in depth introduction to the method of Design of Experiments (DOE) and its application for quality design and improvement.

#### **Computer Usage:**

This course uses a DOE software (Design Ease from Stat-Ease Software) running on desktop PC's. In addition, a spreadsheet (Microsoft Excel) is used to illustrate basic concepts. During the majority of classes students use computers to solve sample problems and to perform data analysis.

## **Course Outcomes:**

As an outcome of completing this course, students will:

- i. Gain an understanding of modern view of quality in products and processes.
- ii. Develop a more in depth understanding of statistical concepts and solution methods and their relevance in quality design and control.
- iii. Gain experience with application of statistical data analysis methods for solving quality design, control, and improvement.
- iv. Gain experience with using statistical software for design and analysis of experiments..
- v. Gain experience and confidence in working in a team environment.
- vi. Gain a facility for producing well-organized and clearly written engineering reports.
- vii. Gain a facility for producing well-organized and clear presentations.

## **Course Outcomes mapped to Program Outcomes:**

Program:	Α	В	С	D	Е	F	G	Η	Ι	J	Κ	L	М	Ν
Course:	ii	ii,iii	iii		iii		vi,vii	i			iii,iv			i
Emphasis:	3	5	3	1	3	1	4	2	1	1	5	1	1	4

# **Topics:**

I. Introduction to Statistics

- 1. Model of Quality Characteristics (QC): Random Variables
- 2. Full information, Partial information & Data Summary
- 3. Gathering information about a QC: Sampling Distributions
- 4. Estimating Parameters of a QC: Point and Interval Estimation
- 5. Testing Hypothesis about a QC: Hypothesis Testing

# II. Statistical Methods for Quality Control

- 1. The Magnificent Seven
- 2. Control Charts for Variables
- 3. Control Charts for Attributes
- 4. Process Capability Analysis

III. Statistical Methods for Quality Improvement and Optimization: Design of Experiments (DOE) and Response Optimization

- 1. Factors, Levels, Response, Design Matrix
- 2. Factor Screening: Factorial and Partial Factorial Designs
- 3. Response Surface Methodology
- 4. Taguchi Method

## **Contribution of Course to Meeting the Professional Component:**

Engineering topics: 100%

## Status of Continuous Improvement Review of this Course:

Prepared by: Professor Pirooz Vakili Date: May 11, 2009