Industrial Engineering 417
Total Quality Management
Fall 2011

INSTRUCTOR: Dr. Majid Jaridi

OFFICE: 303 Mineral Resources Building

OFFICE HOURS: 10:00 - 12:00 M, W or by appointment
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Required Text (for the Six Sigma Portion of the Class)

CSSGB: Primer: Quality Council of Indiana

Recommended Reference Books

Kai Yang and B. El-Haik, Design for Six Sigma, McGraw-Hill Publishing Company, 1st Edition.

Dale Besterfield et al., Total Quality Management, Prentice Hall, 3rd Edition.

Montgomery, Douglas C., Introduction to Statistical Quality Control, John Wiley and Sons, 6th Ed.

Catalog Description

Fundamentals and philosophy of total quality management in industry, education and government. Includes implementation of quality function deployment, and the tools of off-line and on-line quality assurance procedures.

Course Objectives and Philosophy

This course is designed to teach students modern and proven methods of total quality management. Quality and its deployment in all facets of an organization is a vital task that takes more than knowledge of traditional on-line methods of quality assurance. It requires a combination of management skills, statistical procedures, and computer oriented technology. This course is designed to integrate these aspects of quality in order to train quality engineers who will be able to design and implement the principles of total quality management.

Prerequisite

Engineering Statistics (IENG-213) or equivalent.

Student Learning Objectives

Upon completing the course, students will:
a) Possess a general knowledge of various modern quality management techniques.
b) Have a detailed knowledge of quality engineering techniques.
c) Be able to develop and analyze solution strategies for quality related problems using simple design of experiments techniques.

Course Contribution to Professional Component

Engineering Science - 33 %, Engineering Design - 67 %

Course Relationship to Program Educational Outcomes

The course relates to the following program educational outcomes.
1. The course enables the students to acquire the ability to use modern and classical industrial engineering methodologies in quality control and design of quality systems (Outcome 1).
The students are expected to acquire key abilities in the following areas:

a. Analysis of variance
b. Process capability studies
c. International quality standards
d. Quality management issues

2. The course enables the students to work individually and on teams to identify, formulate and develop solution strategies in implementation of quality systems. The course enables the students to also apply knowledge of mathematics (Outcomes 2 and 4).
The students are expected to acquire key abilities in the following areas:

a. Apply statistical tools in decision science modeling
b. Robust designs using Taguchi methods
c. Work as an individual to solve an engineering problem
d. Formulate and solve problems to satisfy system criteria

3. Students will be able to design and conduct simple statistical experiments, analyze and interpret data, and develop recommendation for improved system performance (Outcome 3).
The students are expected to acquire key abilities in the following areas:

a. Design statistical experiments to improve quality
b. Analyze and interpret data from a designed experiment
c. Gather information from a variety of sources including publications, the Internet, and reference materials.

4. The course enables the students to acquire the ability to design total quality systems that include people, materials, and information (Outcome 5).
The students are expected to acquire key ability in the following area:

a. Develop the quality control practices for a system

Grading Basis

Midterm Test	20%
Project Report and Presentation	20%
Final Test	20%
Assignments	10%
Six Sigma Quizzes	30%

Final Grade Policy

> 90%	: A
80% -- 89%	: B
70% -- 79%	: C
60% -- 69%	: D
< 59%	: F

General Policies

1. Makeup tests and incomplete grades are generally not given except as allowed by University policy.

2. Class participation is highly encouraged and will affect the final grade in borderline cases.

3. A number of announced and un-announced short quizzes will be given throughout the semester. Each quiz will count as an "Assignment" and will be graded as such.

4. Starting with the second month of the class, there will be a 20-minute quiz from the Six-Sigma textbook on each Wednesday. Of the 11 quizzes each from one section of the text, the one with the lowest score will be dropped and the remaining 10 will have a weight of 3% each.

Course Topics and Schedule

The following schedule identifies the topic and general preparations for each week.

Week	Topic
1	Introduction: Definition of Quality Assurance The Essence of Quality Control Management and Organizational Issues
2	TQM Philosophies: The American Way: Deming, Juran, Crosby
3.	Japanese contributions: JIT, Poka Yoke, 5S and others Societal Approach: Taguchi's Loss Function
4.	Malcolm Baldridge Award

ISO-9000, ISO-14000

5. Process Improvement with Designed Experiments
The Fundamentals of Experimental Design

Start of Six-Sigma Methodology
Certification Overview (Section I)

6. Factorial Experiments
Six Sigma Goals (Section II)

7. Two and three Level Experiments
Lean and Design for Six Sigma (Section III)

8. Fractional Factorials
Define: Teams and Customers (Section IV)

9. Fractional Factorials
Define: Project, Tools and Results (Section V)
Review and Midterm Test

10. Theory of Robust Design: Taguchi's Methods
Parameter Design Experiments Orthogonal Arrays
Measure: Data and Process Analysis (Section VI)

11. Signal to Noise Ratio Analysis
Measure: Probability (Section VII)

12. Signal to Noise Ratio Analysis
Measure: Capability and Measurement (Section VIII)

13. Using Statistical Analysis System (SAS) to Analyze Results
Analyze: Exploratory Data Analysis/Hypothesis Testing (Section IX)

14. Six-Sigma Methodology
Improve: Techniques for Improvement and Validation (Section X)
Control: SPC and Control Plans (Section XI)

15. Six-Sigma Methodology
Practice Test for Six Sigma Certification