ISYE 3039 METHODS FOR QUALITY IMPROVEMENT

Credit: 3-0-3

Prepared Prof. Shi, 2013

Prerequisite(s): ISYE 2028

Catalog Description:
Topics include quality system requirements, designed experiments, process capability analysis, measurement capability, statistical process control, and acceptance sampling plans.

Text:
D. C. Montgomery, *Introduction to Statistical Quality Control*, Wiley, New York, 7th edition,2012.

Objective
The objective of this course is to teach different methods that can be used for improving the quality of products and processes.

Topical Outline
The following are the topics of coverage and approximate number of weeks of coverage.

Topics	Weeks (tentative)
Introduction to Quality Improvement and Statistical Process Control	1
Statistics and Probability needed for SPC: graphics, probability, tests of hypothesis	1.5
Methods and Philosophies: 7 SPC tools, concepts of process monitoring and variation reduction, basic principles of the Shewhart Chart,	1
Control charts for variables: Xbar-R, Xbar-S, X-MR charts	1.5
Control charts for attributes: counting defects or nonconformities	1
Advanced control charts: CUSUM, EWMA, Multivariate T^2 chart	2.5
Process Capability Analysis: graphs, capability ratios, tolerance design	1.5
Measurement System Analysis: Gage R&R, Gage capability ratio	1
Design of Experiments: Analysis of variance, blocking, factorial designs	1.5
Acceptance Sampling: lot-by-lot sampling, OC curve, guidelines	1
Advanced topics (optional to be used on topics above, or other topics)	1

Outcomes and their relationships to ISyE Program Outcomes

At the end of this course, students will be able to:

- Understand problems and their impacts, formulate problem solving strategies, and design data collection plans;
- Validate collected data, select and benchmark underlining processes;

- Perform preliminary data analysis and suggest improvement plans;
- Design and implement control charts for monitoring continuous and discrete quality characteristics;
- Assess and improve capability of processes and performance of measurement systems;
- Conduct statistically designed experiments, perform primary data analysis and design follow-up experiments to confirm recommended actions; Present studied results, document accomplishments and prepare reference reports.

Course outcome \ Program Outcomes	**a. apply math**	**b. Design, conduct experiment, analyze interpret data**	**c. Design system**	**d. team**	**e. problem solving**	**f. prof/ and ethical responsibilities**	**g. communication**	**h. global, eco, envi and soc context**	**i. Life-ling learning**	**j. Contemporary issues**	**k. use tools for eng. practice**
Understand, strategies, and design data plan			Med		Med						High
Validate collected data		High	Med								
Preliminary data analysis	Low	High	Med		Med		Med				
Design and implement control charts	Med	High	Med		Med		Med				High
Assess and improve capability of processes	Low	High			Med		Med				
Conduct statistically designed experiments	Med	High	Med		Med		Med				
Present results							High				

- Team projects are conducted

Evaluation of the important outcomes

1. A project will be assigned to a team of 2-3 students. Students are expected to conduct experiments, collect data, analyze, draw conclusions, and present the solutions.
2. Homework problems will be used to evaluate student's ability to analyze quality-related data using statistical software and implement quality improvement methods in practice.
3. Exams will be used for evaluating student's understanding of quality concepts and their ability to draw conclusions from the statistical analysis of data.

ISyE ABET Student Outcomes a - k

a) an ability to apply knowledge of mathematics, science, and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multidisciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.