

ISYE 3039 METHODS FOR QUALITY IMPROVEMENT

Required for BSIE

Credit: 3-0-3

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Prerequisite(s): ISYE 3030

Text:

D. C. Montgomery, *Introduction to Statistical Quality Control*, Wiley, New York, 8th edition, 2019.

Catalog Description:

Topics include quality system requirements, designed experiments, process capability analysis, measurement capability analysis, specification/tolerances, and statistical process control.

Course description

This course provides a comprehensive introduction to statistical quality control and improvement methods used in modern manufacturing and service systems. Topics include process variation, control charts for variables and attributes, process capability analysis, measurement capability analysis, acceptance sampling, and the design of quality improvement experiments. Emphasis is placed on understanding the principles behind monitoring and improving process performance using data-driven approaches

Topical Outline

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

Topics	Weeks (tentative)
Course overview + Introduction to quality	1
Basic methods: 7QC tools; review of Modeling and Inferences About Quality	1
Methods and Philosophies	1
Statistical process control: Control charts for variables; Performance of control charts; Control charts for attributes	4
CUSUM and EWMA	2
Design of experiments: Full factorial and fractional factorial experiments	3
Process Capability, Statistical tolerancing, Gauge R&R; quality improvement methods.	1
Specification/Tolerances	1

Outcomes and their relationships to BSIE Program Outcomes

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

1. Understand problems and their impacts, formulate problem solving strategies, and design data collection plans;
2. Validate collected data, select and benchmark underlining processes;
3. Perform preliminary data analysis and suggest improvement plans;
4. Design and implement control charts for monitoring continuous and discrete quality characteristics;
5. Assess and improve capability of processes and performance of measurement systems;
6. 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		Program Outcomes					
1. Understand problems and impacts, formulate problem solving strategies and design data collection plan.		1. identify, formulate solve engg prob by engg, sci & Math		2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic.		3 communicate with a range of audience	
2. Validate collected data, select and benchmark underlining processes;		H				4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	
3. Perform preliminary data analysis and suggest improvement plans;			H			5. effective on a team provide leadership, collaborative and inclusive envirn, plan tasks & meet objectives	
4. Design and implement control charts for monitoring continuous and discrete quality characteristics;		H				H	
						H	
							7. acquire and apply new knowledge using appropriate learning strategies

5. Assess and improve capability of processes and performance of measurement systems;			H				
6. Conduct experiments, perform data analysis, design follow up experiments to confirm actions, present results, report.			H			H	

Assessment of the important outcomes

- H will be assessed.

The approximate relationship from prior ABET a – k to new ABET 1 – 7.

OLD Criterion 3. Student Outcomes The program must have documented student outcomes that prepare graduates to attain the program educational objectives. Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.	NEW Criterion 3: Student Outcomes The program must have documented student outcomes that support the program's educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.
(a) an ability to apply knowledge of mathematics, science, & engineering (e) an ability to identify, formulate, and solve engineering problems	(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
(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 & safety, manufacturable, & sustainable	(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
(d) an ability to function on multidisciplinary teams	(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative & inclusive environment, establish goals, plan tasks, and meet objectives.
(f) an understanding of professional and ethical responsibility (h) the broad education necessary to understand the impact of engg solutions in a global, economic, environmental, & societal context (j) a knowledge of contemporary issues	(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
(g) An ability to communicate effectively.	(3) An ability to communicate effectively with a range of audiences.
(i) a recognition of the need for, and an ability to engage in life-long learning	(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Implied in 1, 2, and 6