KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS
STAT 590: Special Topics in Statistical Process Control
Course Outline

Instructor: Muhammad Riaz   Office: (5-332)

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Office Hours: TBA

Books

Montgomery, D. C. (2013). *Introduction to statistical quality control*. 7th ed. New York: Wiley.

Santos-Fernández, E. (2013). *Multivariate Statistical Quality Control Using R*, Springer New York.

COURSE DESCRIPTION (3-0-3)

Introduction to Statistical Process Control, Process monitoring, Magnificent seven, SPC tool-kit covering Pareto charts, check sheets and control charts, Memory-less Shewhart process monitoring techniques, Performance measures, Memory Structures for efficient monitoring, exponentially weighted moving average (EWMA) charts, multivariate cumulative sum (CUSUM) charts, combined charting structures based on EWMA and CUSUM schemes, Process Capability analysis, Acceptance sampling plans (single, double and sequential), Multivariate statistical process control.

OBJECTIVES

The aim of this course is to develop the foundations of statistical process control, implementation of different memory and memory-less structures and their applications in different disciplines The memory and memory-less process monitoring techniques will be discussed both in univariate and multivariate setups. The applications of these techniques will be presented using some real problems from different disciplines including engineering, medical, environmental sciences, agriculture and industrial processes.

Assessment

Activities	Weight
Class Activities (Assignments, Quizzes and participation)	15%
Mid Term	30%
Final exam (comprehensive)	40%
Project	15%

Grades: The letter grades will assigned based on relative performance of the registered students.

Notices: Any notice about the course will be communicated to the students through blackboard.

Syllabus:

Week	Topics
1-2	Introduction to Statistical Process Control
	(Background of process monitoring, Magnificent seven, SPC tool-kit covering Pareto charts, check sheets and control charts)
3-4	Memory-less process monitoring techniques and Performance measures
5-6	Memory Structures for efficient monitoring
	(exponentially weighted moving average (EWMA) charts, multivariate cumulative sum (CUSUM) charts, mixed charting structures based on EWMA and CUSUM schemes)
7-8	Process Capability analysis
9-11	Acceptance sampling plans (single, double and sequential)
12-14	Multivariate statistical process control
	(Multivariate data matrix, mean vector and variance—covariance matrix, Mahalanobis distance, Hotelling statistic, Hotelling T^2 chart, chi-square chart, generalized variance chart, Limitations of multivariate charting techniques)
15-16	Projects Discussions

Project Description

The project should be based on a real problem (with complete description) and a detailed analysis using the skills developed in the course. There should be some concluding remarks that refer to the real implications of your chosen problem, preferably in your major area. You may use online sources in your project with proper citation/reference.

Project Requirements:

- Each group should contain a maximum of 5students.
- Each group should submit the following:
    - a formal report (pdf)
    - a power point presentation

Deadline: The end of semester (before the last day of classes)

Submission: email submission to riazm@kfupm.edu.sa + A Hard copy