İzmir Institute of Technology
Department of Food Engineering

FE 535
STATISTICAL PROCESS MONITORING AND QUALITY CONTROL
(3-0) 3

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Statistical process monitoring (SPM) is a method of monitoring and controlling the process variation through statistical analysis. The purpose is to detect abnormality in the process and identify the causes behind this variation. This course is about statistical techniques to monitor and control process and quality variables. The objective is to give the students the idea about SPM and how it can improve quality and productivity of a process. Statistical tools introduced in this course can be used with various kinds of data from different disciplines.

The course will focus on the statistical process monitoring and quality control techniques used in science and engineering. The content covers statistical process monitoring charts for variables and attributes. Descriptive statistics including mean, standard deviation, variance, probability distributions will be given. The concept of univariate charts such as Shewhart, cumulative sum and exponentially weighted moving average charts will be followed by autocorrelation and crosscorrelation in process data. The techniques for multivariable processes with correlated data will be introduced.

Prerequisites: No prerequisites are required.

Text Book: Montgomery, Douglas C., *Introduction to Statistical Quality Control*, 2005, Wiley

Course Outline

I. Introduction
- I1. What is Statistical Process Monitoring (SPM)
- I2. General Statistics: mean, standard deviation, variance, median, continuous and discrete probability distributions, significance tests, confidence intervals, normality plot, Analysis of Variance (ANOVA)
- I3. Tools of Statistical Process Control: Histogram, pareto chart, cause and effect diagram, scatter diagram, control chart

II. Univariate Control Charts
- II.1. Control Charts for Attributes: Charts for defects and nonconformities
- II.2. Control Charts for Variables: X, Range, and S charts
- II.3. CUSUM Charts
- II.4. EWMA Charts
- II.5. Process Capability Analysis

III. Autocorrelation in Data
- III.1. Definitions
- III.2. Diagnosis of Autocorrelation
- III.3. Effects of Autocorrelation
- III.4. Control Charts for Autocorrelated data

IV. SPM of Multivariate Process
- IV.1. Why do we need Multivariate SPM Techniques?
- IV 2. Multivariate SPM Charts (Hotelling's T^2 Chart)
- IV.3. Multivariate SPM based on Residuals
- IV.4 Principal Component Analysis