# New Course Announcement for Spring, 2004

# Ch.E. 252: Monitoring Process and Control System Performance

Instructor:	Dale. E. Seborg, Room 3335, Eng. II (seborg@engineering.ucsb.edu)
Time:	10-10:50 AM, MWF
Place:	Room 3301, Eng. II
Text:	None
Prerequisite:	Introductory course in either process control or automatic control (or consent of the
-	instructor).

#### **Grade Distribution**

Home Problems	10%
Mid-term Quiz	25%
Term Project	30%
Final Exam	35%

#### **Course Description**

This course provides an introduction to general strategies that can be used to monitor the performance of complex processes and their automatic control systems. Process monitoring is concerned with two broad issues (i) Is the current process operation normal or abnormal (*fault detection*)? (ii) If the performance is considered to be abnormal, what is the root cause (*fault diagnosis*)? Control system monitoring is concerned with similar issues but different monitoring strategies and methods of analysis are employed. Both model-based and data-driven monitoring strategies are considered. Emphasis is placed on statistically-based techniques that can be used to analyze multivariate time-series data.

## Topics

- 1. Statistical Quality Control (SQC)
- 2. Multivariate statistical methods: Principal Component Analysis (PCA) and Projection to Latent Structures (PLS)
- 3. Pattern matching in multivariate time-series data
- 4. Model-based monitoring techniques
- 5. Monitoring individual control loops
- 6. Monitoring model-predictive control systems

## **General References**

- Chiang, L. H., E. L. Russell and R. D. Braatz. *Fault Detection and Diagnosis in Industrial Systems*. Springer, London (2001).
- Kourti, T. Process analysis and abnormal situation detection: From theory to practice. *IEEE Control Systems Magazine*, **22**(10), 10–25 (2002).
- Shah, S. L., R. Patwardhan and B. Huang. Multivariate controller performance analysis: Methods, applications, and challenges. *Chem. Proc. Control-VI, AIChE Symposium Series No. 326, Vol.* 98, 190–207 (2002).
- Simani, S., C. Fantuzzi, and R.J. Patton, *Model-Based Fault Diagnosis in Dynamic Systems* Using Identification Techniques, Springer, NY (2003).