

**Dr. Dan Apley**

Department of Industrial Engineering and Management Sciences,  
Northwestern University

**Title:**               **Discovering Sources of Manufacturing Variation with High-Dimensional Data**

**Date:**               **November 14, 2006 (Tuesday)**

**Time:**              **9:40 am**

**Place:**             **Goldwater Center GWC 510**

**Abstract:**

In modern manufacturing processes, large quantities of multivariate data are routinely available through automated measurement and sensing. The data generally contain a great deal of buried diagnostic information that can aid in identifying and eliminating major root causes of manufacturing variation. Traditional statistical process control tools, which were designed for situations in which data are much less abundant, do not take full advantage of in-process measurement. In this talk I will discuss an approach that is much better suited for this scenario. Each major variation source is assumed to leave a pattern in the data. Given a sample of multivariate measurement data, the approach involves blindly identifying the number of patterns that are present and the spatial and temporal nature of each pattern. Here, "blind" refers to the fact that no prior knowledge of the variation sources or their patterns is assumed. The blindly identified patterns can be graphically illustrated to help process operators and engineers visualize the nature of the patterns and identify and eliminate their root causes. The approach borrows from blind source separation concepts that were originally developed in the sensor-array (e.g., radar) signal processing arena. The talk will cover basic blind separation principles and extensions that make it an effective and versatile tool for manufacturing variation reduction.

**Bio:**

Daniel W. Apley is an Associate Professor of Industrial Engineering and Management Sciences at Northwestern University, Evanston, IL, where he serves as the Director of the Manufacturing and Design Engineering Program. He obtained B.S., M.S., and Ph.D. degrees in Mechanical Engineering and an M.S. degree in Electrical Engineering from the University of Michigan. Prior to joining Northwestern University in 2003, he served on the faculty of Texas A&M University for five years. His primary research interests are manufacturing variation reduction and quality control, with a focus on processes in which advanced measurement, data collection, and automatic control technologies are prevalent. He received the NSF CAREER award for his research and teaching in this area in 2001. He is a past chair of the Quality, Statistics & Reliability Section of INFORMS, and currently serves as an Associate Editor for Technometrics and on the Editorial Board of the Journal of Quality Technology.

For further information about the seminar series, or to be added to the seminar announcement e-mail list, please contact Dr. Esma Gel <esma.gel@asu.edu>.