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2.830J / 6.780J / ESD.63J Control of Manufacturing Processes (SMA 6303)
Spring 2008

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Control of Manufacturing Processes

Subject 2.830/6.780/ESD.63

TEAM PROJECT GUIDELINES

Spring 2008

Syllabus Details

- **Prerequisites:** One of the following :
 - 2.008 or 2.810 Manufacturing
 - 2.751J or 6.152J or 6.041 or 15.064J
- **Required Texts:**
 - Montgomery, D.C., *Introduction to Statistical Quality Control*, 5th Ed. Wiley, 2005
 - May and Spanos, *Fundamentals of Semiconductor Manufacturing and Process Control*, John Wiley, 2006.
- **Grading:**
 - Problem sets 40%
 - Quizzes 40%
 - **Team Projects 20%**
- **Assignments:** All except project are to be individual efforts
- **Final exam:** No final exam

Team Projects

- Topical Areas:
 - Process Diagnosis
 - Process Improvement
 - Process Optimization / Robustness
 - Advanced Applications
- Expectations
 - Background research on process and problem
 - Use of existing data or generation of new data
 - Oral presentation of results
 - Project report from group

Team Projects

- Structure: Teams of 3 or 4 students
- Expectations
 - Comparable to one assignment and final quiz
- Project Proposal: **Due May 1**
 - 1-2 page summary of problem and plan
 - Identify team members, roles
 - Each group must meet with Boning or Hardt by **May 6**
 - Video-conference for NTU-based students
- Group Presentation: **Due May 13 or May 15**
 - In-class presentation
 - Date (Tuesday or Thursday) will be assigned
- Group Report: **Due May 16**

Example Topics

- Process Optimization
 - Lab Processes of Bending or Injection Molding
 - Analysis of Industrial Data Sets
 - Review of Advanced SPC or Robustness
- Advanced SPC Methods
 - Multivariate Problems
 - Feedback Approaches
 - Coupled Processes and Quality Propagation

Specific Suggestions

- Investigation of Cycle to Cycle Control versus Run by Run Control
- Investigation of time series (dependent) statistics and effects of ignoring dependence
- SPC for short production runs
- SPC on the process not the product
- Modeling and Optimization of
 - Sheet Bending
 - Injection Molding
- Application of Multivariate SPC - Comparison to Univariate
 - e.g.. on Injection Molding with 2 outputs and inputs

Report Outline

- Problem Definition
- Background - State of Art (References)
- Experiments / Data
- Analysis
- Discussion
- Conclusions
- Lessons Learned

Note: IEEE format template to be used for written report

Projects 2007

- Axle Quality Data Evaluations
- Ethanol Production
- Process Diagnosis (C-K) Using Nested Variance
- Oxide Etch Control
- Surface Roughness Optimization
- CFD Robust Design

Projects 2006

- Modeling Analysis of Laser Bending Process
- Variation Analysis of Integrated Circuit Device Performance
- Optimization of Si CVD Process on SiGe Surfaces
- Control Charts for Attributes in Printed Circuit Board Manufacturing
- Semiconductor Laser Power Optimization
- Optimization of a Blow Molding Process
- Optimization of a Laser Diode Process

Projects 2005

- Process Model of Microembossing
- Optimization of Dry Burn Times for I.M. Parts
- Process Model for Injection Molding
- CVD Optimization using OFAT
- Review of Statistical Control Practices in Semiconductor Manufacturing
- Exploration of Spatial Variation Modeling
- Optimization of a MOSFET Process
- Optimization of Loaf Volume in Bread Making
- Effect of TiO_2 deposition on Reflectivity
- Response Model for Sheet Metal Blanking
- Response Model for Surface Quality in Milling
- Optimization of a Blow Molding Process
- Optimization of a Laser Diode Process

Recap

- Teams of 3 or 4
- Proposal by May 1
- Meeting with Boning or Hardt
- Presentation in Class (~15 min)
- Report Due on May 16