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:**

• **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