Course Summary

1. Evolution of Quality Design & Control
   - Quality revolution
   - Historical perspective
   - Modern Quality Philosophy
   - Quality & the Engineering Design Process
   - Strategic View of Quality Improvement: Variation, S/N
   - Contrasting approaches: increasing S versus reducing N
2. Conceptual Framework for Quality
   - Deming’s Philosophy
     14 Obligations of Top Management
   - Traditional view of quality
     Engineering Specifications
   - Taguchi’s definition of quality
     Loss function
   - Cost-of-quality
3. Statistics Review
- Characterizing data
- Probability distributions
- Normal distribution
- Calculating and working with probabilities
- Sampling distributions
  In particular for sample means
- Normal probability plot

- Hypothesis testing
  x’s and xbar’s; $\alpha$ and $\beta$ risk; Type I and II errors
4. Concept of SPC
   - Origin & Characteristic Behavior of Variability
   - Process Behavior over time
   - Shewhart’s ideas - economic control
   - Control chart - process management
   - Process of SPC

5. Statistical Basis for Shewhart Control Charts
   - Control charts -- connection with hypothesis testing principle
   - X-bar control chart
   - R control chart
6. Control Chart Details
   - Mechanics of chart construction
   - Interpreting control charts
   - Example - cylinder boring process
   - Graphical techniques (Scatter diagram, Pareto chart, cause & effect diagram)

7. Rational Sampling
   - Sample size, frequency, selection considerations
   - Consecutive vs. distributed sampling
   - Stratification and Mixing

- Chapter 8 -- Workshop #1
9. Process Capability
   - Process capability vs. process control
   - Calculating capability: %, Cp, and Cpk
   - Boring example revisited
   - Variation in Assemblies
   - Statistical assignment of tolerances
   - Loss function
   - What happens when things go wrong....

10. Roll Mill Process Case Study

• Workshop #2
11. Control Charts for Individuals
   - X and Rm
   - EWMA Charts

   - Regression
   - Autocorrelated data -- time series
   - Reliability
   - 6 sigma
13. Control Charts - Attribute Data
- Definitions (defects, defectives, operational definitions)
- Binomial distribution
- p chart
- np chart
- p chart variable sample size charts
- Poisson distribution
- c chart
- u chart

14. Case Studies for Attributes
- Press 120 -- Molding process
- Accounts payable process
Final Thoughts

• Many of you will be leaving MTU -- good luck!!

• You have a great education -- your potential is unlimited -- don’t settle. Be ambitious -- aim high!!

• Never stop learning. A degree is only a first step.

• Got questions?? -- contact us.

• As time goes by, you will look back fondly on your days at MTU. Stop in one of these days (or drop us a note) & let us know how you are doing.