

# ETLS 506 Statistical Methods for Manufacturing Quality

Dr. Marvin Seppanen, P.E.  
Fall Semester 2009

**Instructor:** Dr. Marvin S. Seppanen, P.E.  
Productive Systems  
2225 Garvin Heights Road  
Winona, MN 55987-5465

**Time:** Section 1, Thursday, 5:30 – 8:30 p.m.

**Location:** St. Paul Campus, OSS LL10

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**Required Text:** *Applied Statistics and Probability for Engineers*, 4th Edition Montgomery and Runger, John Wiley, 2007 ISBN 0-471-74589-8.

<http://he-cda.wiley.com/WileyCDA/HigherEdTitle/productCd-0471745898,courseCd-E80500.html>

Class Web Site is on [Blackboard](#)

**Optional Software:** Minitab Statistical Software: <http://www.minitab.com/>  
A 30-day version is downloadable at no cost or can be supplied at the reference desk of the UST library.

**Course Description:** An introduction to the basic philosophy of the statistical tools used to assure manufacturing quality. Tools to include hypothesis testing, regression analysis, analysis of variance, process capability, control charts (SPC), and six sigma. Students will conduct and report an industry-based statistical application project.

**Course Objectives:** An introduction to the basic philosophy of the statistical tools used to assure

manufacturing quality. Tools to include: hypothesis testing, regression analysis, analysis of variance, process capability, control charts (SPC) and six sigma. Students will conduct and report an industrial based statistical application project.

**Learning  
Outcomes:**

1. Learn the common probability distributions associated with manufacturing process and properties of those distributions. (H,T) (SE6, SE8)
2. Learn the utility of various statistical measures of random processes and how such measurements can be made in the manufacturing environment. (H,T) (SE6, SE8, MS1)
3. Learn how to use the concept of Statistical Hypotheses Testing in evaluating manufacturing processes. (H,T) (SE6, SE8, MS5, MS6)
4. Learn how to compare the sample statistics generated from two random processes. (H,T) (SE6, SE8)
5. Learn how to apply Simple Linear Regression to data set arising from manufacturing processes. (H,HT,P) (SE6, SE8, MS5, MS6)
6. Learn the basic concepts Design of Experiments: Analysis of Variance. (HT,P) (SE10)
7. Learn how to specify, construct, and interpret Process Control Charts for manufacturing operations. (H,HT,P) (SE6, SE7, MS4, MS6, MS7)

**Course  
Methodology:**

Combination of lecture, case studies, class discussion, student presentations, and software demonstrations. Lecture notes will be presented in the PowerPoint format and available on the course web site. Excel solution templates and example problems will also be available on the web site.

**Associated  
Courses:**

ETLS 506 is a prerequisite for ETLS 600, 701 and 778.

**Major  
Assignments:**

- **10%** Weekly (10) In-class and homework problems (H) (late homework discounted 10% per week). Most homework problems will be best solved using computer software. Any of several statistical packages (Minitab, SAS, SPSS, ...) may be used, but all required homework could be done using Excel. When time permits, the homework problems will be discussed and solved in class. Class discussion will be included in this grading component.
- **20%** Mid-Term examination (T) using Excel (Week 7)
- **40%** Ten page Statistical Application Case Study paper (P) based on your current work assignment. The paper and a 7 minute oral presentation with **five** PowerPoint slides will be due in Week 13.
- **30%** Final examination (HT) using Minitab (Week 14)

<b>Grading Policy:</b>	96% - 100%	A
	92% - 96%	A-
	88% - 92%	B+
	84% - 88%	B
	80% - 84%	B-

**Academic Integrity:** All students are expected to understand and follow the University of St Thomas policies on Academic Integrity. These are described at:  
[www.stthomas.edu/engineering/graduate/policies](http://www.stthomas.edu/engineering/graduate/policies)

Exams:

Exams are one of the instruments used to evaluate the knowledge gained by an individual student of the class subject matter, and the progress towards meeting the outcomes of the class and the degree. To this end all exams (in class or take home) are intended to represent the effort of the individual and not a group effort unless specifically stated otherwise.

**Attendance Policy:** Students are expected to attend all class sessions. Circumstances which prevent attendance will be honored up to two instances. Absences in excess of two times Dec. result in a lower grade for the course. Contact the instructor when a special situation arises. All absences require that the instructor be informed in advance.

**Students with Disabilities** Qualified students with documented disabilities who Dec. need classroom accommodations should make an appointment with the Enhancement Program – Disability Services office during the first two weeks of the semester. Appointments can be made by calling 651-962-6315 or in person in O’Shaughnessy Educational Center, room 119.

**ETLS 506****Statistical Methods for Manufacturing Quality****Fall 2009****Note: No Class on November 26, 2009**

<b>Date</b>	<b>Topics</b>	<b>Chapter</b>
Week 1 Sept. 10	The Role of Statistics in Engineering Probability	Read Chapter 1
Week 2 Sept. 17	Discrete Random Variables and Probability Distributions	Read Chapters 2 and 3 Homework set 1
Week 3 Sept. 24	Continuous Random Variables and Probability Distributions	Read Chapter 4 Homework set 2
Week 4 Oct. 1	Random Sampling and Data Description Point Estimation of Parameters	Read Chapters 6 and 7 Homework set 3
Week 5 Oct. 8	Statistical Intervals for a Single Sample Discuss Project Topics and Structure	Read Chapter 8 Homework set 4
Week 6 Oct. 15	Tests of Hypotheses for a Single Sample Statistical Inference for Two Samples	Read Chapters 9 and 10 Homework set 5
Week 7 Oct. 22	Present Project Proposal Mid-Term Examination	1-page Project Proposal
Week 8 Oct. 29	Simple Linear Regression and Correlation	Read Chapters 11 and 12 Homework set 6
Week 9 Nov. 5	Design and Analysis of Single-Factor Experiments: The Analysis of Variance	Read Chapters 13 and 14 Homework set 7
Week 10 Nov. 12	Statistical Process Control	Read Chapter 16 Homework set 8
Week 11 Nov. 19	Statistical Process Control Gage R&R - Six Sigma	Read Chapter 16 and on-line material Homework set 9
Week 12 Dec. 3	Goodness-Of-Fit (GOF) testing Introduction to Simulation	Read on-line material Homework set 10
Week 13 Dec. 10	Oral Application Case Study Presentation	10-Page Application Case Study Paper, Presentation with 5-PowerPoint slides
Week 14 Dec. 17	Course Evaluation Final Exam using Minitab	