

SIE 606 ADVANCED QUALITY ENGINEERING - Spring 2022

(Tuesday/Thursday Hybrid mode with TA in classroom and using Zoom)

Instructor: Allan T. Mense, Ph.D., PE, CRE

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Prerequisites: SIE 406/506 and SIE 430/530 Engineering Statistics

Textbook D.C. Montgomery, *Introduction to Statistical Quality Control*, 7th ed. or higher, Wiley, New York, 2012 (6th edition also OK)

Course Website: We will be using the D2L system. (<http://d2l.arizona.edu/>). All class materials, including HW, handouts, etc. will be distributed from D2L. I will also be sending emails to the whole class throughout the semester using the class list in D2L. Please make sure you forward your D2L email to an email account that you frequently use.

Course videos: D2L-> UA Tools -> Panopto

References:

- : R.A. Johnson and D.W. Wichern, *Applied Multivariate Statistical Analysis*, 5th ed., Pearson Prentice Hall, Upper Saddle River, NJ, 2007. (This is an advanced text you will have a pdf copy given to you by the instructor)
- B.G. Tabachnick & L.S. Fidell, *Using Multivariate Statistics*, 5th Ed., Pearson Education, Allyn & Bacon, Boston, MA , 2007.

Course Objectives: This course covers topics in quality control that have been widely used in many industries. Specifically, it reviews single variate techniques (much like SIE 506) and then covers multivariate statistical analysis techniques that are used in *quality control* applications. . The goal is for students to better understand the concepts, operation, limitations, and role of the important analytic techniques. Students will learn the math background for validating the SPC tests, Students should think through what they wish to cover in their project.

Homework: The homework will be assigned, and the due date listed on each homework. . NO late submission is allowed unless it is requested and approved by the instructor or TA in advance (e-mail or phone-call received *before* the day the assignment is due).

Examinations:

There will be 3 quizzes all taken on D2L

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Grading:

Homework 20%

Quizzes 30%

Project 50%

Academic Integrity Policy: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, homework, and exams must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity: <http://dos.web.arizona.edu/uapolicies/>. Any violation of the academic integrity code will be dealt with using the procedures detailed in the code.

Course Outline: (Not all material in each chapter will be covered)

Part 1 Lecture 1 (Chapter 2) Statistics Refresher & The DMAIC process

Part 2 Lecture 2 & 3 (Chapter 3) Modeling Process Quality EXPLAIN Excel based tools

Lecture 4 & 5(Chapter 4) Inferences about Process Quality

Part 3 Lecture 6 (Chapter 5) Statistical Process Control (background)

Lecture 7 (Chapter 6) Control Charts for Variables

Lecture 8 (Chapter 7) Control chart for attributes

Lecture 9 (Chapter 8) Process Analysis and MSA

Part 4A Lecture 10 (Chapter 9) Cumulative sum and EWMA

Lecture 11 (Chapter 10) Other univariate control techniques

Part 4B Lecture 12 & 13 (Chapter 11) Multivariate SPC

Lecture 14 & 15(Chapter 12) Engineering Process Control

Lecture 16 & 17 Advanced topics e.g. Principal Components, Factor Analysis

Part 5 Lecture 18 (Chapter 13 & 14) Using DOE for process improvement

Part 6 Lecture 19 (Chapter 15 & 16) Lot Acceptance Testing (LAT)