ISE 426 STATISTICAL QUALITY CONTROL

Spring 2021

(tentative syllabus)

Instructor: Dr. Q. Huang, Professor
Epstein Department of Industrial & Systems Engineering
E-mail: qiang.huang@usc.edu (preferred); Tel: 213-740-2433 (office)
Web: HuangLab.usc.edu

Online Class Schedule on Zoom (*From Friday, Jan 15 to Friday, April 30*)

Lecture: TTh 11:00-12:20pm, Zoom Meeting ID:
Office hours: Th: 9:30-11am Zoom Meeting ID:
Other time by appointment

Website and links: blackboard.usc.edu

TA: Chris Henson, Office hour/Lab Session: TBD, E-mail: cmhenson@usc.edu

- Examples of problem solving
- Excel/R for homework and project

PREREQUISITE: ISE 225 Engineering Statistics I (or equivalent)

REQUIRED TEXT:

Textbook *Introduction to Statistical Quality Control*, **7th Edition** by Douglas C. Montgomery, 2013, John Wiley & Sons, Inc., New York. ISBN : 978-1-118-14681-1

Lecture Notes: *Lecture notes are posted in Blackboard.*

References

Engineering Statistics by Douglas C. Montgomery, George C. Runger, and Norma F. Hubele, John Wiley & Sons, Inc., New York.

COURSE OBJECTIVES

This course presents data analytics perspective of statistical quality control and introduce data-driven process control methods. The learning objectives include:

- applying principles and models of control charts to build data analytics tools to monitor the status of engineering processes;
- designing and selecting effective control charts to monitor engineering processes;
- analyzing and evaluating capabilities of processes and measurement systems with properly collected data;
- using data analytics software to implement statistical quality control methods;
- demonstrating the ability of designing and implementing statistical quality control methods by solving real world problems.

CLASS PHILOSOPHY

Research has demonstrated that best learning occurs when the learner is actively involved in an inclusive environment. Students are expected to come to online class and participate in learning

activities. All members of this class are expected to contribute to a respectful and inclusive environment.

SEMESTER CALENDAR

Classes Begin	Fri	January 15
MLK Day	Mon	January 18
President's Day	Mon	February 15
Wellness Day (No classes)	Fri	March 12
Wellness Day (No classes)	Tue	March 23
Wellness Day (No classes)	Wed	April 7
Wellness Day (No classes)	Thu	April 22
Wellness Day (No classes)	Fri	April 30

Tuesday, March 16, Midterm Exam
Thursday, March 18, Project Proposal and Presentation
April 27 &29, Final Project Report and Presentation
Classes End Fri April 30
Final Exam, Wednesday, May 12, 2-4 p.m.

1. TENTATIVE COURSE SCHEDULE

Week	Date	Topics
1	Lecture	Introduction to the course / Chapter 1: Quality Improvement in the Modern Business Environment Chapter 2: DMAIC Process Chapter 3: Modeling Process Quality
2-3	Lecture	Chapter 3: Modeling Process Quality Chapter 4: Inferences about Process Quality
4	Lecture	Chapter 5: Methods and Philosophy of Statistical Process Control
5-6	Lecture	Chapters 6 Control charts for Variables
	Lab	*Midterm exam review* *In-class data science project*
7		**Midterm Exam (Ch1-6)** **Project Proposal Presentation - Wednesday**
8-10	Lecture	Chapter 7: Control Charts for Attributes
	Lab	*In-class data science project*
11-13	Lecture	Chapter 8: Process and Measurement System Capability Analysis
	Lab	*In-class data science project*
13	Lecture	Chapter 9: Exponentially Weighted Moving Average Control Charts
		Final Exam Review and Q&A *In-class data science project*

14		Final Project Report and Presentation

2. COURSE GRADING

Homework sets = 30%
Quizzes = 10%
Participation = 5% (individual and group participation)
Exams = 45% (Midterm Exam: 25%, Final Exam: 20%)
Project = 10% (Report due on)
Total = 100%

Grading scale:

A: [95, 100]; A-: [90, 95); B+: [85, 90); B: [80, 85); B-: [75, 80);
C+: [70, 75]; C: [65, 70]; C-: [60, 65]; D: [50, 60]; F: <50

The class project credit (10% of final grade) includes two components: presentation (4%), which will be evaluated by peers, and final project report (6%).

3. POLICY ON BONUS POINTS

You can earn bonus points if you correct all wrong solutions for midterm exam questions. Bonus points will not be directly added to your final grade. It will be only used when your letter grade is close to the next (higher) level.

4. QUIZ POLICY

You will solve quiz problems with a randomly assigned group. If you miss one quiz, you have 24hr grace period to finish the quiz and receive full credit.

Quiz problems are designed to get you familiar with exam problems. Make sure you correct the mistakes after each quiz.

5. IN-CLASS GROUP PROJECTS

We will conduct in-class data science projects with assignments at the Shared Google Sheets (posted in Blackboard). You can choose a group to work with on each project and you may be asked to present your results.

6. CLASS PROJECT

Please form a team of **four or five**. In the final project report, all team members should sign and state that they contribute to their project roughly equally. Every member will receive the same grade on the project.

All reports should be typewritten and printed out for handing in. The report should not exceed 8 pages. (12 point, double space, Appendix does not count to 8 pages.) The report must have a professional appearance. Clarity and thoroughness of the analysis, and good use of the English language, including grammar, spelling and punctuation, are considered in grading the project.

Final project report includes project objective, problem statement, solutions, conclusions, and appendix if needed. The report should describe the background, any assumptions made, the analysis used to analyze the data, and the appropriate results. Explanation, interpretation, and

justifications are required. Computer output should be included in an appendix and the description of the outcome/results included in the text of the report.

Sample Class Projects:
Example 1: *IPod Nano Nike Plus System Capability Analysis:* The team used IPod Nano to measure the distance and time of runs and analyze the capability (repeatability and reproducibility) of the device's pedometer.

Example 2: *Defects in Skittles.* Individual bags of Skittles come in with about 15 skittles per each bag. There are five different flavors you might receive in a pack, each being a different color. However, many times, these candies are defective. The team aimed to analyze and control the defects.

Example 3: *Beer: Not All are Created Equal*: In this report, the team aimed to answer this question through the statistical analysis and comparison of different qualities of beer. Using control charts and regression analysis, the team determined if a more expensive beer would lead to a better tasting beer when compared to a cheaper beer. In addition, the team also measured the variance between different raters.

Example 4: *Monitoring Los Angeles Housing Prices*: The team attempted to predict and monitor housing prices in Los Angeles using dataset from Kaggle.

7. CLASS POLICIES

- Grading is purely based on the merit of your work. Request of extra credit or higher grade for other reasons will NOT be considered.
- Assigned homework will be collected **in Blackboard**. Homework is due one week after it is assigned. ***No late homework will be accepted***.
- *Cellphones are not allowed during exams*.
- ***Per instructions of USC final examination policy, "No student is permitted to omit or take early a final examination and no instructor is authorized to permit a student to do so."***
- Exams will be closed book, closed notes. One 8 ½ x 11 formula sheet can be used. Be sure to bring your calculator. There will be ABSOLUTELY NO SHARING among students of books, formula sheets, or calculators.
- If you believe there was an error in the grading of an exam or homework, then you can submit the entire exam to the TA requesting a regrade. This must be done ***within one week*** from the date the exam was returned. The entire exam will be regraded, so that you may gain, or lose, points by resubmitting.
- Students are responsible for all information conveyed during class and on Blackboard. It is the student's responsibility to make sure they are receiving their official USC email.
- Always bring your textbook to class! Also bring your calculator, notebook, pencils/pens, eraser, and course syllabus.

8. COURSE WEBSITE

The course will use Blackboard: blackboard.usc.edu. You can also use smartphone app Bb MobileLearn to access Blackboard.

9. SOFTWARE USAGE:

Software is required for control charting in homework and project (not in exams). Statistical computing software R or Python will be introduced. You can use Excel templates provided in the class as well.

Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.
engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class.
equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations.
dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.
Provides overall safety to USC community. dps.usc.edu