Technical Elective: DOE and Quality Assurance

Fall 2022

Class

- Time: Friday 8:15 AM -11:00 AM
- Location: Rm 4-210

Instructor

- Name: Di Liu
- Email: di.liu@scupi.cn
- Office: Rm 3-324A

Office hours

- Right after each class in the classroom or online meeting room.
- Wednesday 1:30 PM - 4:30 PM, or by appointment.

Notes

- This syllabus is subject to change. Please follow updates announced during class and posted on Blackboard website.
- When emailing the instructor, please include "TE: DOE and Quality Assurance" in the subject field of your message. Use your university email account (student_ID_number@stu.scu.edu.cn), since mails from other accounts might be stopped by the SCU spam filter. Thanks! ^_^

Course Objectives

The primary objective of this course is for students to learn how to apply the most common experimental design methods and statistical process control tools used to improve the quality of product and enhance the performance of processes. In addition, students enhance their ability in design by using these methodologies in a basic engineering design framework that coordinates these activities.

Prerequisites

- IE 1070, IE 1071

Applicable ABET Outcomes

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- An ability to identify, formulate, and solve engineering problems
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- A knowledge of contemporary issues, and
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbook

Doug Montgomery. *Introduction to Statistical Quality Control*, 7th edition. Wiley, 2013.

(A reference book: Montgomery, D.C., Jennings, C.L., and Pfund, M.E. (2010) *Managing, Controlling, and Improving Quality*, John Wiley & Sons, NY. (ISBN 978-0-471-69791-6))

Assessments

- In-class Quiz: 10%
- Homework: 20%
- Midterm Exam: 30%
- Final Exam: 40%

Grade

90.00 – 100.00 A	85.00 – 89.99 A-	80.00 – 84.99 B+	76.00 – 79.99 B	73.00 – 75.99 B-
70.00 – 72.99 C+	66.00 – 69.99 C	63.00 – 65.99 C-	60.00 – 62.99 D	0.00 – 59.99 F

Class Policy

Regular attendance is essential and expected. Important dates and plans will be announced during class. **It is imperative that you come to class prepared.** This will generally involve reading one or more chapters of the textbook, thinking, engaging with fellow students, practice and performing preliminary calculations. This is a three credit hours class, which means you should expect to devote at least 9 to 12 hours of effort outside the scheduled class time every week.

Homework and Other Assignments

Homework problems and other assignments will be assigned periodically and are due as stated in the assigned paper. All work will be submitted electronically through the Blackboard system. Late submission **WILL NOT** be accepted. **Students' names and ID numbers** must be listed on the first page. It is your duty to make sure that submission through Blackboard has been properly processed. Unless specifically requested, emailed homework will not be accepted. If you have a compelling emergency that prevents you from turning in the homework on time, please email the instructor.

All of the homework scores will be used in your grade computation. Unless otherwise indicated, you can work with your fellow classmates in the class, but you must submit a distinct and independent write-up to receive credit. If plagiarism is caught, zero score for all homework.

If you believe an error has been made in the grading of an assignment, bring it to the attention of the instructor **within ONE WEEK** from its return.

Please adhere to these homework guidelines:

- Put your name, and ID number (last 4 digits) at the top of the first page.
- All work must be shown for each solution to receive full credit. Present your solution in a logical fashion, showing and explaining all steps in detail.
- Obtaining the correct answer includes getting the correct quantity, number of significant digits, sign, and unit.

Exams

There will be two exams (one Midterm and one Final), all are **CLOSED-BOOK**. Students can bring one A4 page note and it must be **hand-written on two sides** of the paper. It cannot be a photocopy. If you must miss an exam, you **MUST** make alternative arrangements with the instructor before the exam is given. If you miss an exam without prior notification, you will receive a score of "**ZERO**" for that exam except under extenuating circumstances.

Make-Up Exams

Students who have not taken either the midterm or the final exam are NOT eligible to take the make-up exam. Only 75% of the make-up exam grade can be used to replace the final exam grade. Students taking make-up exams can only attain at most a "D" grade.

Avoiding Plagiarism

- Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
- Paraphrasing, when the original statement is still identifiable and has also no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together Unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.

Minitab:

Minitab Statistical Software is a comprehensive statistical and graphical analysis software package used by many quality engineers/professionals and data analysts around the world. I would like to encourage each of you to install the software on your laptop or desktop computer, or use Minitab in the Labs.

Tentative Topics

- Introduction to quality engineering   Chapter 1
- Introduction to DOE   Chapters 13 & 14
  - One-factor experiments
  - Factorial designs
  - Fractional factorial designs
  - Response surface methodology
- Introduction to SPC   Chapters 5,6,7, & 8
  - Control charts for variables
  - Control charts for attributes
  - Special control charts
  - Process capability