Spring 2025 Statistical Analysis of Chemical Processes

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Class Hours/Location: T Th 10:00-11:15, Sears 439
Office Hours/Location: T 11:15-12:15, AW Smith 157 or by appointment

Course Description: This course covers the role of statistics in chemical processes. Topics include Six Sigma methodology, lean manufacturing, statistical quality control, design of experiments (DOE), hypothesis testing, ANOVA and regression. Basic statistical software (e.g., Minitab, Excel) will be used throughout the class.

Course Resources:

1) Introduction to Statistical Quality Control by Douglas C. Montgomery, 8th ed. (if you really want to get the 7th ed. that book is compatible with the course as well)
   a. Available on Amazon or the Bookstore

2) MiniTab 21
   a. Available at the CWRU software center for free download (do this ASAP). If you have trouble, please email help@case.edu

Upon completion of the course, students will be able to:

1. Use statistical methodology and tools in analyzing a set of data and answer a chemical processing question.
2. Propose appropriate experiments given a chemical processing question and constraints on resources.
3. Compute and interpret descriptive statistics using numerical and graphical techniques.
4. Understand the basic concepts of probability, random variables, probability distribution, and be able to calculate confidence intervals.
5. Have a working knowledge of Six Sigma and lean management techniques.

Grades: Grades will be determined as such:
50% Mid-term exams (2)
20% Homework assignments (10)
30% Final (1)

The breakpoints between letter grades may be lower, but will not be higher than A = 90.0%, B = 80.0%, C = 70.0%, D = 60.0%

Website for Course Information: Course information can be found on Canvas. The website is limited to enrolled students. Please visit the website regularly.

Attendance and Participation: I hope you actively participate in this course, and I welcome your thoughts, questions, and comments. Also, I encourage all of us to cultivate an environment that is positive, respectful, creative and open. *It is possible that from time to time we will need to meet online. The zoom information for the class is posted at the end of the syllabus.*

Exams: Exams will be taken in the same classroom as lectures during our regular meeting times unless a student qualifies for accommodations. The exams are open note, homework, homework solutions and open book. You may use a calculator for the exam, but no phones or computers. Exams are to be the individual work of the student. Students are not allowed to consult with each other, or any outside resources (e.g., other people, the internet, or artificial intelligence) on the exams.

Homework: Homework is an integral part of the class, and where the main software skills will be practiced and learned. Homework also serves as excellent study material for exams. Students are welcome to work together on homework. Homework is assigned such that once a section is completed in lecture, the homework for that section is due one week later. You should use course materials to answer questions, and refrain from copying answers or definitions found on the internet or from AI. Homework which is found to be copied from an online resource, or copied/modified from and AI generated answer will be considered in violation of the academic integrity policy and receive a zero. All homework will be uploaded to Canvas for grading.

All questions on the homework should be initially directed to the course TA

Regrade Policy: After 24 hours and within one week of receiving a graded assignment or exam, it can be submitted for a compete regrade of the entire document via Canvas (see website). A written description of the grading error must accompany the document. The final points on the assignment may increase or decrease upon regrade. The 24 hour waiting period is to allow sufficient time for students to review the solutions and draft their written descriptions.

Late Policy**:** Your lowest homework grade will be replaced by a 100% on the assignment. This allows you to drop one homework assignment during the class without penalty. You can turn in a late assignment for 50% of the points within three days of the original due date. Assignments past three days will be given a zero. Missed exams require a university approved exception (which requires documentation) or otherwise will receive a zero. Missed final exams will be handled per university policy: https://bulletin.case.edu/undergraduate-academics/academic-policies-procedures/#text

Reading: Suggested chapters for reading are highlighted in the schedule below. Reading will help with homework and reinforcement of topics learned in class.

Diversity and Inclusion Statement: It is my intention that students from all backgrounds and perspectives will be well served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability, and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated!

Lived Name/Pronoun: I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

Academic Integrity Policy: All students in this course are expected to adhere to university standards of academic integrity. Cheating, plagiarism, misrepresentation, and other forms of academic dishonesty will not be tolerated. This includes, but is not limited to, consulting with another person during an exam, turning in written work that was prepared by someone (or AI) other than you, making minor modifications to the work of someone else (or AI) and turning it in as your own, copying definition or wording from an online resource as your own, or engaging in misrepresentation in seeking a postponement or extension. If you are not sure whether something you plan to submit would be considered either cheating or plagiarism, it is your responsibility to ask for clarification. For complete information, please go to: http://bulletin.case.edu/undergraduatestudies/academicintegrity/

Disability Resources: ESS Disability Resources is committed to assisting all CWRU students with disabilities by creating opportunities to take full advantage of the University's educational, academic, and residential programs. For further information, please go to https://students.case.edu/academic/disability/

Schedule of Topics

Please check the website regularly for added reading materials and changes. Schedule subject to change.

Week	Dates	SQC Chapter	Assignment
1	1/14 (Lecture 1) Start of Test 1 Material 1/16 (Lecture 2)	Chapter 1 (Concepts) Chapter 2 (Concepts)	
2	1/21 (Lecture 3) 1/23 (Lecture 4)	Chapter 3 (Tools) Chapter 3 (Dist. Funct)	**HW 1 Due (Chap 1-2)**
3	1/28 (Lecture 5) 1/30 (Lecture 6)	Chapter 4 (Hypoth 1) Chapter 4 (Hypoth 1)	**HW 2 Due (Chap 3)**
4	2/4 (Lecture 7) 2/6 (Lecture 8)	Chapter 4 (Hypoth 2) Chapter 4 (Hypoth 2)	**HW 3 Due (Chap 4 part 1)**
5	2/11 No Class (subject to change) 2/13 No Class (subject to change)		**HW 4 Due (Chap 4 part 2)**
6	2/18 (Lecture 9) 2/20 (Lecture 10) End of Test 1 Material	Chapter 4 (Hypoth 3) Chapter 4 (Hypoth 3)	
7	2/25 (Lecture 11 – Test Review) virtual 2/27 No Class (study day)		**HW 5 Due (Chap 4 part 3)**

8	**3/4 EXAM** 3/6 (Lecture 12) Start of Test 2 material	**Test 1** Chapter 4 (ANOVA)	
9	3/11 No class -spring break 3/13 No class -spring break		
10	3/18 (Lecture 13) 3/20 (Lecture 14)	Chapter 4 (ANOVA) Chapter 4 (Regression)	
11	3/25 (Lecture 15) 3/27 (Lecture 16)	Chapter 4 (Regression) Chapter 4 (Regression)	**HW 6 Due (Chap 4 part 4)**
12	3/1 (Lecture 17) 3/3 (Lecture 18) End of Test 2 Material	Chapter 5-6 (C-Charts) Chapter 5-6 (C-Charts)	**HW 7 Due (Chap 4 part 5)**
13	4/8 (Lecture 19) 4/10 (Lecture 20)	Chapter 13 (DOE) Chapter 13 (DOE)	**HW 8 Due (Chap 5-6)**
14	**4/15 EXAM** 4/17 (Lecture 21)	**Test 2** Chapter 13 (2^k)	
15	4/22 (Lecture 22) 4/24 (Lecture 23)	Chapter 13 (2^k +) Chapter 13 (2^k +)	**HW 9 Due (Chap 13)**
16	4/28		**HW 10 Due (Chap 13)**

Final: May 8th 8-11 AM

Topic: ECHE 313

Join Zoom Meeting
https://cwru.zoom.us/j/494086199?pwd=YmNDcjdpQ1R3eWhmUlNUZUlQbVFUQT09

Meeting ID: 494 086 199
Passcode: 780266