

SIE 406/506 QUALITY ENGINEERING - FALL 2025

(Tuesday and Thursday 12:30 – 1:45 PM, AME S212)

Instructor and Contact Information

<u>Instructor:</u>	Dr. Jian Liu, Professor of the Department of Systems & Industrial Engineering
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<u>Office Hours:</u>	Tue. 8 – 9 PM or by Appointment

Course Description and Overview

This course will provide senior undergraduate and graduate students and introduction to the concepts, principles and tools to conduct statistical quality control for manufacturing and service processes. Students will be exposed to a variety of statistical techniques in quality engineering contexts. The course is composed of a systematic introduction of the fundamental topics of statistical quality engineering, including: (1) probability theory & statistical inference, (2) statistical process control charting, (3) risk and process capability assessment, and (4) acceptance sampling. The emphasis is placed on understanding when and how to apply specific tools, interpreting results correctly, and supporting future design and decision-making. Real-world manufacturing engineering and service processes and data will be used as illustration examples.

Course Objectives and Expected Learning Outcomes

The objective of this course is to prepare engineering students with fundamental knowledge and computation skills for statistical quality control. Graduate students will develop deeper understanding of theoretical foundations of statistical inference. By taking this course, both **undergraduate** and **graduate** students will possess the capability to:

- (i) Characterize, model, and make inference from quality data;
- (ii) Apply statistical control charts for different types of quality data collected from different manufacturing and service processes;
- (iii) Assess the risks of statistical control charts and process capability;
- (iv) Design plans for acceptance sampling

For graduate Students, additional learning outcomes include:

- (i) Understand the theoretical basis for statistical process control;
- (ii) Development of statistical quality control tools for given engineering problems.

Course Prerequisites:

Advanced Standing: Engineering

Reading Materials

Textbook: "Introduction to Statistical Quality Control," D. Montgomery, 7th edition.

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 on D2L. Please make sure you forward your D2L email to an email account that you frequently use.

Lecture videos will be available after each lecture on D2L → UA Tools → Panopto.

Temporary Lecture Schedule:

Lecture	Topics	References
1	Course overview + Introduction	Ch 1
2	Modeling Process Quality	Ch 2
3	MPQ + Inferences About Quality	Ch 2/3
4	Inferences About Quality	Ch 3
5	Inferences About Quality	Ch 3
6	Inferences About Quality	Ch 3
7	Methods and Philosophies	Ch 4
8	Methods and Philosophies	Ch 4
9	Quality Control Philosophies & Applications	Ch 4
10	Charting Variables	Ch 5
11	Charting Variables	Ch 5
12	Charting Variables	Ch 5
13	Implementing Charts + Charting Attribute	Ch 5+6
14	Group project discussion	
15	CUSUM	Ch 8
16	Review Session for Exam I	
17	Exam I (in class)	
18	CUSUM + EWMA + MA	Ch 8
19	Short Production Runs	Ch 9-1
20	SPC with Autocorrelated Data	Ch 9-4
21	Process Capability	Ch 7
22	Project Preparation	
23	Gage R&R	Ch 7
24	Specification/Tolerances	Ch 7
25	Acceptance Sampling	Ch 14
	Acceptance Sampling	Ch 14
	Project Preparation	
	Project Preparation	
	Project Preparation	
26	Review Session for Exam II	
	Exam II	

The above topics and schedule are subject to change. Revisions in the syllabus may occur as the semester progresses.

Homework:

The homework will be assigned on Thursdays and due on the following Thursday, *before 11:59 PM*. NO late submission is allowed unless it is requested and approved by the instructor in advance (e-mail or phone-call received *before* the date the assignment is due). You are encouraged to discuss homework problems with fellow students. But your final product should be based on your own understanding. Copying other's work is not acceptable.

Examinations:

Exam I: October 30, 12:30 – 1:45 PM, for on-campus students (AME, S212), any 75-min time slot for distance learning students

Exam II: December 17, 1:00 – 2:30 PM for on-campus students (AME, S212), any 90-min time slot for distance learning students

(detailed arrangements will be announced in class.)

Makeup examinations **MUST** be requested at least one week prior to the date the exam is held. In case of medical or other personal/family emergencies, a formal excuse (doctor's note, etc.) is required.

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.

Project:

Project requirements and guidance will be posted on **TBD**. Teamwork, individual contribution, and group presentation will be required and evaluated.

Grading Scale and Grade Policy

I - Grading:

Course grades for **undergraduate** section will be determined based on the following items.

Course Work	Points	Percentage
Homework	15	15%
Exam I	30	30%
Exam II	35	35%
Project	20	20%
TOTAL	100	100%

Graduate students will have additional advanced (sub)questions in assignments and examinations, which reflect higher requirements on the understanding of statistical modeling, inference, and evaluation. Course grades for the **graduate** section will be determined based on the following items.

Course Work	Points	Percentage
Homework	15	15%
Exam I	30	30%
Exam II	35	35%
Project	20	20%
TOTAL	100	100%

The grading scheme will follow the distribution below. University policy regarding grades and grading systems is available at <http://catalog.arizona.edu/policy/grades-and-grading-system>.

Points	Percentage	Letter Grade
90-100	90%-100%	A
80-89	80%-89%	B
70-79	70%-79%	C
60-69	60%-69%	D
<60	<60%	E

There is no extra credit for any student.

Dispute of Grade Policy: Students disputing a grade on any grade item (e.g., homework and exam) must do so within a week of the graded work being returned. Note: unexcused absences will not extend this deadline.

Classroom attendance:

- If you feel sick or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructors if you will be missing an in person or online course.

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <https://deanofstudents.arizona.edu/policies/attendance-policies-and-practices>. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, see: <http://policy.arizona.edu/human-resources/religious-accommodation-policy>. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <http://policy.arizona.edu/employmenthuman-resources/attendance>.

Academic advising: If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

Life challenges: If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges: If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Remain flexible: If pandemic conditions warrant, the University may require that we return to remote operations. If that is the case, we will notify you by D2L Announcement and email that we are moving to remote operations.

Class Recordings: Course recordings will be made for every lecture. If you do not wish to be identified by name, please contact the instructor immediately and solutions will be discussed according to FERPA Privacy Protection guide. For lecture recordings, which are used at the discretion of the instructor, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies are subject to suspension or civil action.

Inclusive Excellence Statements

This course supports elective gender pronoun use and self-identification; rosters indicating such choices will be updated throughout the semester, upon student request. As the course includes group work and in-class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. (NOTE: You can download your class roster from UAccess)

Inclusive Excellence is a fundamental part of the University of Arizona's strategic plan and culture. As part of this initiative, the institution embraces and practices diversity and inclusiveness. These values are expected, respected and welcomed in this course.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See: <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): <https://cirt.arizona.edu/case-emergency/overview>

Also watch the video available at

https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy00000000003560

UA Nondiscrimination and Anti-harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see: <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>.

Accessibility and Accommodations (for students with Disability)

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268) to explore reasonable accommodation.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

If our class meets at a campus location: Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable. Their website is <http://drc.arizona.edu/instructors/syllabus-statement>.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>
Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Use of Generative AI

This course is designed to build your original thinking, writing, and problem-solving skills, and using generative AI tools to replace this work would interfere with your learning. Therefore, using

generative AI to complete graded assignments in this course will be considered a violation of the [Code of Academic Integrity](#), specifically the prohibition against submitting work that is not your own. If you have any questions or want to talk about using AI, please contact your instructor.

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.