

SIE 330R: INTRODUCTION TO DESIGN OF EXPERIMENTS

Spring 2016

Instructor	Mickey V. Mancenido	Hours	T-Th 2:00 – 3:15
Email	mickey@email.arizona.edu	Room	CHVEZ 405

Course Page: <https://d2l.arizona.edu/d2l/home/480851>

Instructor Office/Hours: ENGR 310 M (3:00 - 4:15); Th (4:00 - 5:15)

TA: Wanlu Gu, wanlugu@email.arizona.edu **Office/Hours:** ENGR 306 Wed (12:00 - 2:00)

Reference: Montgomery, D. (2013), *Design and Analysis of Experiments*, 8th ed., John Wiley and Sons.

Objective: The principal objective of this course is for students to understand, recall, and apply the basic principles of designing and analyzing engineering and scientific experiments.

Prerequisites: SIE 305. An understanding of basic statistical concepts (e.g., hypothesis testing, p-values, sampling distributions, the central limit theorem) is required prior to taking this course. Knowledge of Analysis of Variance (ANOVA) is helpful but not required.

Key Learning Outcomes

1. Understand, recall, apply the RRB principle of DOE: Replication, Randomization, Blocking
2. Understand, recall, apply the scientific way of designing experiments
3. Analyze experimental data using the Analysis of Variance (ANOVA)
4. Understand, recall, apply the basic experimental designs: CRD, RCBD, Latin Squares, 2^k , 2^{k-p}
5. Determine the most appropriate experimental design given an engineering/scientific problem

Tentative Course Outline

Ch 1. Strategy of Experimentation	≈ 1 day
Ch 2. Simple, Comparative Experiments	≈ 3 days
Ch 3. Single-factor Experiments (CRD, ANOVA)	≈ 4 days
Ch 4. Blocked Designs (RCBD, Latin Squares)	≈ 2 days
Ch 5. General Factorial Design	≈ 3 days
Ch 6. 2^k Factorial Designs	≈ 4 days
Ch 7. Blocking in the 2^k Factorial	≈ 2 days
Ch 8. 2^{k-p} Fractional Factorial Designs	≈ 4 days
Special Topics	≈ 2 days

Grading Policy

Course grade is based on the 1000-point system. For each course requirement, a student can earn:

Homework, quizzes, exercises	100 pts
Exam 1	200 pts
Exam 2	200 pts
Final	200 pts
Project	300 pts
Total	1000 pts

This makes it easier to track your progress in class. For each requirement, there will be bonus points that will be meted throughout the semester.

Examples of bonus points:

- A bonus item in Exam 1 could earn 5 points
- An unannounced quiz could earn 2 bonus points

Bonus points are the **instructor’s prerogative**. No extra-credit work will be given. To pass the course, you need at least 700 points. Table 1 shows the conversion from points to letter grades.

Table 1: Converting from Points to Letter Grade

900 – 1000	A
800 – 899	B
700 – 799	C
600 – 699	D
< 600	E

Tentative Exam Dates

Exam 1	23 Feb
Exam 2	22 Mar
Final	Finals Week

Class Policies

- █ **Attendance.** Unannounced bonus quizzes will be given for points, so attendance is essential and expected, but not required.
- █ **Lecture Notes.** Lecture notes will be posted on the website the day before.
- █ **Required Homework.** Required homework will be graded and are due **one week** after assignment. Solutions to required homework will be posted on the website. **Homework will be collected during class. Submissions outside class hours or via email will not be accepted.** If, for some reason you cannot attend class, have a classmate submit your homework for you.
- █ **Submission of Project Requirements.** Late submission of project requirements **WILL NOT** be accepted for any reason.

Exam Policies

- **Technology.** A basic, scientific calculator is the only electronic equipment allowed in exams. No phones, computers, and wearable devices of any kind.
- **Open Journals.** The exam is open-journal, but closed-book, closed-everything else. See section on the journal system.
- **Coverage.** For each exam (including the Final), the focus is on the set of topics discussed for that segment. However, due to the nature of this course, knowledge of some previous topics is required to successfully answer all questions.
- **Re-grade.** To appeal an exam score:
 - On a separate piece of paper, provide a detailed explanation why you are requesting a re-grade.
 - Staple the explanation to the front of the exam.
 - Submit the documents to the instructor **within a week** after the exam was returned.
 - The instructor will re-grade the entire exam, not just the specific items that were requested for re-checking. **The instructor maintains the prerogative of increasing/decreasing points as a result of re-grading.**
- **Missed Exams.** A student can make up for a missed exam under these circumstances:
 - The instructor was informed in writing at least 1 week before the exam. Further, the instructor gave consent, depending on the circumstances for missing the test. In addition, the student is expected to present written evidence supporting the reason.
 - In case of emergencies or exam-day incidences, the student is expected to present written evidence (e.g., medical certificate) within 7 days of the exam date. **NO WRITTEN EVIDENCE, NO MAKE-UP TEST. NO EXCEPTIONS.**

A student can only make up for one missed test. The make-up test is scheduled at the end of the semester and **COMPREHENSIVE** in coverage.

Journal System

To succeed in this class, follow the journal system. A journal is a notebook preferably 7.5in × 10in. The notebook should be sewn-bound. The basic example of a sewn-bound notebook is the composition notebook.

A student can write and paste anything in the journal – notes taken down in lectures, formulas from hand-outs, handwritten solutions to homework and exercises. The emphasis is on **handwriting entries** to the journal, which helps in concept retention.

A student is allowed to use the journal(s) in the exam, given the journal is compliant. If the journal is not compliant, the instructor will confiscate it during the exam. The following are the cases of non-compliance:

- The journal is not sewn-bound. Have your journals approved at the beginning of the semester to avoid this.
- During the exam, the instructor will inspect and shake each journal. Anything that folds out, falls out, or comes out of the journal goes straight to the trash.

Project

Projects will be accomplished in teams of 3–4 students. The instructor will assign a project at the start of the semester. Project requirements will be assigned and submitted in the course of the semester.

Software

Minitab is our software companion for this semester. It will be used in most homeworks and in the project. Exams will include some Minitab output for analysis. Seventeen (17) licenses are available in ENGR 125/127 and 8 more are installed in the library.

Minitab is also available to rent at OnTheHub.com for \$30/6 mos. You can install a free trial version for 30 days. Renting/buying the software is not required for this class, but strongly recommended.

Academic Integrity

Lack of knowledge of the Code of Academic Integrity is not a reasonable explanation for a violation. For more information, visit: [The University of Arizona Code of Academic Integrity](#).

There is zero tolerance towards plagiarism and any act of intellectual dishonesty. I use an online plagiarism checker, so be mindful of citation practices.

The instructor maintains the prerogative to make changes to the covered topics and the duration of each topic.

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By signing below, I acknowledge that I read and understood all parts of the syllabus.

Student Name _____
Signature _____
Date _____