

IE 6308-001/002/003 / Spring 2013
Design of Experiments

Professor: Victoria (Tory) Chen, 420J Woolf Hall.

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Classes: MWF 11:00–11:50PM in 404 Woolf Hall. **Office Hours:** MF 3:30–4:30PM.

GTA: TBD.

Text: *Design and Analysis of Experiments* by Angela Dean and Daniel Voss, 1999.
<http://www.wright.edu/~dvoss/book/DeanVoss.html>

Reference: *Applied Linear Statistical Models* by J. Neter, M. Kutner, C. Nachtsheim, and W. Wasserman, 1996. *Statistical Design and Analysis of Experiments* by R. Mason, R. Gunst, and J. Hess, 1989. *Design and Analysis of Experiments* by D. Montgomery, 2001. *Applied Statistics for Engineers and Physical Scientists* by R. Hogg and J. Ledolter, 1992.

Prerequisite: IE 5318.

Description: Introduction to statistical design and analysis of experiments with applications from engineering, medicine, and agriculture. Analysis includes analysis of variance, multiple comparisons, and model adequacy. Designs include factorial, block, and hierarchically nested.

Student Learning Objectives: At the end of this course, students should be able to: (1) understand fundamental concepts of experimental design, (2) construct basic experimental designs and collect designed data, (3) perform proper analysis on real data, and (4) interpret the analysis.

Exams: Both the midterm and final will be open book, open notes, and open calculator. Copies of the required text are not permitted and will be confiscated if brought to an exam. Please bring your UTA ID card to all exams. Students must sign an academic honesty statement on the exam. Report cheating to me.

Project: There will be one project, consisting of two parts: proposal and full report. You may work in groups of two or three. Project data will be collected by the group, so do not leave data collection to the last minute!! Actual data is not required in the proposal, but your group must clearly discuss the problem of interest, the experimental design to be used, and how the data will be collected. The full report should include data and analysis with good discussion and should be typewritten. Please see the project handout for further details. Copying (including from past students' reports) is not permitted.

Homework Policy: You may work in groups (including SAS work). However, you must write up your assignment separately, written in your own words, and with the necessary supporting computer output. Copying (including from past students' assignments) is not permitted.

Makeup Policy: A makeup test will be given if the student provides *legitimate written documentation* proving an illness or emergency. If necessary, I may request additional information to verify the validity of your documentation. If you cannot attend an exam, you should make every effort to contact me beforehand.

Regrading Policy: If you would like a test/project regraded, you must submit a written statement which clearly explains the reason you would like a regrade. Please note that the *entire* test/project will be regraded.

Attendance: Attendance will be taken at the beginning of class approximately 4 times during the semester. Students present will earn an attendance point. Each student's accumulated attendance points are added to the raw score of the final exam.

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 9 hours per week of their own time in course-related activities, including reviewing lecture content, reading required materials, completing assignments, etc.

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current graduate catalog.

Academic Integrity: All students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence. I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

Instructors may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, Section 2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/ses/fao>).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the Americans with Disabilities Act (ADA). All instructors at UT Arlington are required by law to provide "reasonable accommodation" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities, such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week, *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Inclement Weather Policy: If the University is closed this class will not meet. Any scheduled assignments or examinations will be rescheduled to the next class period that the class meets. You can get information by dialing 817-272-8821 or 972-601-2049.

Grading (tentative):

5% each	4 Homework Assignments. Last assignment is due Monday, April 29th.
20%	Midterm in class Wednesday, March 6th.
30%	Project: proposal due Monday, March 25th, report due Wednesday, May 1st.
30%	Final: Wednesday, May 8th, 11:00AM–1:30PM.

Course Outline (tentative):

1. One-Factor Experiments (Examples: 3.7–3.8, 4.6)
 - 1.1 Introduction: Ch. 1, 3.1–3.2
 - 1.2 Fixed Effects Model: 3.3
 - 1.3 Estimation: 3.4
 - 1.4 Analysis of Variance: 3.5
 - 1.5 Inferences for Factor Level Effects: 4.1–4.3
 - 1.6 Simultaneous Inferences: 4.4
 - 1.7 Planning Sample Sizes: 3.6, 4.5
 - 1.8 Residual Analysis: 5.1–5.7
 - 1.9 Heteroscedasticity: 5.6.2–5.6.3, Neter et al. (1996) pp. 764–775
2. Design of Experiments
 - 2.1 Introduction: Ch. 2
 - 2.2 Factorial Experiments: 6.1–6.3, 7.1–7.2
 - 2.3 Block Designs:
 - 2.3.1 Randomized Complete Block Designs: 10.1–10.3, 10.8
 - 2.3.2 Incomplete Block Designs: 11.1–11.2
 - 2.3.3 Row-Column Designs: 12.1–12.3
 - 2.4 Two-Level Fractional Factorial Experiments: 13.1–13.2, 13.4 (13.3.1), 15.1–15.2
 - 2.5 Nested Designs: 17.1, 17.3.1, 17.6.1, 18.1–18.2
3. Analysis of Experimental Designs
 - 3.1 Analysis of Complete Factorial Experiments: 6.4–6.8, 7.3–7.7
 - 3.2 Analysis of Block Designs
 - 3.2.1 Randomized Complete Block Designs: 10.4–10.5, 10.7–10.9, 6.7.3
 - 3.2.2 Incomplete Block Designs: 11.3–11.4, 11.6–11.10
 - 3.2.3 Row-Column Designs: 12.4–12.10
 - 3.3 Analysis of Two-Level Factorial Experiments: 13.11, 15.8
 - 3.4 Analysis of Nested Designs
 - 3.4.1 Random and Mixed Effects: 17.2–17.8, 17.10
 - 3.4.2 Hierarchically Nested and Cross-Nested Designs: 18.3–18.5

Distance Education Policies: A distance student is defined as a student enrolled in the distance section of an IE course. The section numbers for distance sections are typically “002” or “003.”

1. Distance students are required to communicate with the faculty before the second class period. This “first contact” helps ensure that the distance student is not left behind at the beginning of the semester. Students are encouraged to do this before class begins each semester. You are responsible for contacting the instructor via e-mail to comply with the requirements for taking the course through the Internet.
2. Exams must be taken within 24 hours of the regularly scheduled exam. Students who live within 50 miles of campus must come to campus to take all exams. Students should make every effort to take exams on campus during the regularly scheduled time. If this is not possible, alternate exam times will be scheduled. Students living more than 50 miles from campus may take the exam with an approved proctor. Students will be responsible for identifying a proctor. Proctors must be approved by the faculty at least two weeks before the first exam. The proctor should be associated with the testing facility of a community college, a library, a university or a professional testing center, such as a Sylvan Learning Center. Students are responsible for any fees charged by the testing facility.
3. Distance students are expected to complete all of the regular requirements for a class. This includes submission of homework assignments within 24 hours of the in-class students. To facilitate this, the faculty will establish homework due dates that provide enough time for the distance student to view the material on the WEB page and to complete the assignment. In most cases, homework may be submitted electronically. Laboratory assignments are handled on a class-by-class basis. The faculty will actively try to accommodate the distance student. However, in some cases, the DFW Metroplex distance student will be required to come to campus to complete a laboratory assignment. The student should communicate with the faculty before enrolling in a course to understand the laboratory requirement.
4. The distance student is expected to have the minimum level of technology required to receive the distance programs. The minimum recommended technologies are given below.
 - Processor operating at 400 MHz or higher.
 - DSL/cable modem Internet connection capable of 256 kbps sustained data rate.
 - Video Software - A free RealPlayer is available from www.real.com. There is a version of RealPlayer for the Mac, and a few Linux/Unix boxes, but we do not provide support for those platforms.
 - Web Browser - Our courses are designed to use Microsoft Internet Explorer 5.0 or better. Many of the necessary features will NOT operate with Netscape, Mozilla, or other browsers.

If you plan to watch the streaming video courses from your office, be sure that there will not be any firewall issues prohibiting the access of the video player. You will want to investigate your company's equipment and policies before committing to this distance education option.