

**STAT:3210 - Experimental Design & Analysis, Spring 2019**  
Syllabus

**Instructor:** Dr. Erning Li

Office hours: MWF 1:00–2:00pm, and by appointment

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Grader: TBA

**Class Meeting:** Lectures 11:30am–12:20pm MWF in W207 PBB.

**Department Information:** Department of Statistics and Actuarial Science, 241 SH, Phone 335-2082

Departmental Executive Officer: Professor Joseph B. Lang, 241 SH, Phone 335-0712, Email *joseph-lang@uiowa.edu*

**Course Prerequisite:** STAT:3200.

**Course Description and Objective:** This course emphasizes practical aspects of experimental design and analysis. Both design and analysis of experiments as well as statistical computing (primarily R) are discussed. At the end of the semester, students should understand the principles, models and strategies commonly used for experimental design and data analysis, and be comfortable planning and analyzing experiments.

Main coverage: Basic principles of experimental design; Randomization; Completely randomized design; Paired design; Randomized blocks, Latin Squares, Greco-Latin Squares and related designs; Factorial design; Blocking in factorial design;  $2^k$  factorial design; Extension of  $2^k$  factorials; Blocking and confounding in  $2^k$  factorials; Partial confounding; Fractional factorial designs; Blocking in fractional factorials; Nested and split-plot designs; Replicated and un-replicated designs; Regression, ANOVA, and follow-up analysis; Power calculation; Sample size determination; Relative efficiency; Response surface; Random effects model.

**ICON Course Website:** Course materials including syllabus, lecture notes, homework assignments, answer keys, data, supplemental materials, grades, etc. will be posted on ICON <http://icon.uiowa.edu/>. Make sure your email address on ICON class roster is valid, as important class announcements are sent via ICON.

**Lecture Notes:** My lecture notes posted on ICON in advance will be intensively used. Students are strongly recommended to bring a hard copy of lecture notes and meanwhile take notes in class.

**Book** (recommended):

Montgomery, D. C. (2017), *Design and Analysis of Experiments*, 9th edition, Wiley.

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP003675.html>

**R Software:** R is open-source statistical software and available in Instructional Technology Centers (ITCs) such as 41 SH. It is freely available at <http://www.r-project.org>

Download and install R for Windows: <http://cran.r-project.org/bin/windows/base/>  
Click on Download R for Windows (the latest version or a recent version) and save to disk, double-click on the R .exe file, go through install pages.

Download and install R for Mac OSX: <http://cran.r-project.org/bin/macosx/>  
Click on the R .pkg file and save to disk, double-click on the R .pkg file, go through install pages.

An R introductory tutorial: <http://cran.r-project.org/doc/manuals/R-intro.html>

**Homework:** Homework will be assigned periodically and posted on ICON. Students will turn in their assignment to Dr. Li at the beginning of class on its due date. Unless prior or prompt arrangements are made for reasons judged to be acceptable by Dr. Li, homework turned in after it is due will receive 0 (zero) credit. No soft (electronic) copies of homework will be accepted. Homework should be neat and stapled with name at the top of the first page. Students are allowed to discuss homework assignments, but everyone should do his/her own programming and write up his/her own answers; no blind “copying” permitted.

**Exams:**

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|----------------|---|
| Midterm Exam 1 | (tentative) Friday, March 1, in class.  |
| Midterm Exam 2 | (tentative) Monday, April 15, in class.   |
| Final Exam     | see the university final examination schedule;<br>comprehensive with emphasis on newer materials. |

You can bring *One* standard size (8.5in × 11in) sheet of paper with anything you want written or typed on both sides to each midterm exam, and *Three* such help sheets to the final exam. Also bring a scientific calculator (any type) to each exam. Other than these, all exams are closed-book and closed-notes.

Students who miss an exam without documented university-approved excuses will receive 0 (zero) score on that exam. If you have a university-accepted reason to miss an exam, notification and documentation (written evidence such as a doctor’s note, a police report for an accident, a letter from a pastor for a funeral, or other related materials) should be provided to Dr. Li promptly (e.g., no later than two days after a midterm exam). A makeup exam (different but equivalent to the original) will be permitted only when the circumstances of missing the exam satisfy university policies and should be scheduled as soon as possible.

Do not schedule your end-of-semester travel plans until the final exam schedule is announced by the university. It is your responsibility to know the date, time, and place of the final exam.

**Grading:** A numerical final score on the scale of 0 to 100 will be determined according to the following breakdown

Homework	14%
Midterm 1	26%
Midterm 2	26%
Final	34%

Conversion of these scores into letter grades will be made according to the following scale:

[90, 100]	<i>A</i>
[80, 90)	<i>B</i>
[67, 80)	<i>C</i>
[50, 67)	<i>D</i>
< 50	<i>F</i>

At the discretion of Dr. Li, depending on performance and attendance, these ranges may be adjusted (but only downward - criteria will only become easier, not harder).

Plus (+) and minus (-) gradings will be given as deemed appropriate. The College asks that the A+ grade be used only in extraordinary situations.

**Integrity of Course Materials:** I request that you preserve the integrity of the course materials and reference books. This means that under no circumstance should you make public (either in print or via web postings, social networks, etc.) any solutions of the book, homework and exam problems; nor may you disseminate notes, handouts and other materials that I prepare. You must also strive to avoid making use of any solutions provided by anyone outside of this class. Compliance with this request will be considered part of the academic honesty requirements discussed further below under Administrative Policies.

**Attendance and Classroom Environment:** Attendance is very vital to your success in this course. Regular attendance is required and roll will be taken frequently on random days. Students who are absent from class without acceptable excuse should not seek help regarding missed lectures during my office hours.

When in class, please refrain from talking on cell phones, texting, using laptops/tablets (if not for note-taking purpose), and prolonged conversation with a fellow student. Wireless-capable devices such as laptops, tablets, smartphones, smartwatches, etc. must be put away during exams.

### UI and CLAS policies and procedures

**Administrative Home:** The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at <https://clas.uiowa.edu/students/handbook>.

**Electronic Communication:** University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences (Operations Manual, III.15.2, k.11).

**Accommodations for Disabilities:** The University of Iowa is committed to providing an educational experience that is accessible to all students. A student may request academic ac-

commodations for a disability (which includes but is not limited to mental health, attention, learning, vision, and physical or health-related conditions). A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor's office to make particular arrangements. Reasonable accommodations are established through an interactive process between the student, instructor, and SDS. See <https://sds.studentlife.uiowa.edu/> for information.

**Nondiscrimination in the Classroom** The University of Iowa is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity, [diversity@uiowa.edu](mailto:diversity@uiowa.edu), or visit [diversity.uiowa.edu](http://diversity.uiowa.edu).

**Academic Honesty:** All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty: "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

**CLAS Final Examination Policies:** The final examination schedule for each class is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar's web site and will be shared with instructors and students. It is the student's responsibility to know the date, time, and place of a final exam.

**Making a Suggestion or a Complaint:** Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

**Understanding Sexual Harassment:** Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Office of the Sexual Misconduct Response Coordinator for assistance, definitions, and the full University policy.

**Reacting Safely to Severe Weather:** In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Department of Public Safety website.