STAT:3200 - Applied Linear Regression   Fall 2025
Cross References DATA:3200, ISE:3760, IGPI:3200
The University of Iowa
The College of Liberal Arts and Sciences

Instructor: Prof. Erning Li, 231 SH, 335-0820, *erning-li@uiowa.edu*

Office hours: MWF 2:00–3:00pm, or by appointment.

Graders: TBA

Department Information: Department of Statistics and Actuarial Science, 241 SH, 335-2082, `https://www.stat.uiowa.edu/`
DEO: Professor Kung-Sik Chan, 241 SH, 335-0712, *kung-sik-chan@uiowa.edu*

ICON Course Website: Course materials including syllabus, lecture notes, homework assignments, supplemental materials, data, answer keys, grades, etc. will be posted on ICON `https://icon.uiowa.edu/`.

UI Email: Students are responsible for all official correspondences sent to their UI email address (uiowa.edu) and must use this address for any communication with instructors or staff in the UI community. For the privacy and the protection of student records, UI faculty and staff can only correspond with UI email addresses.

Lecture Notes: My lecture notes posted on ICON in advance will be intensively used. Students are strongly recommended to diligently take additional notes in class.

There is no required textbook. Reference books:

Applied Regression Analysis & Generalized Linear Models, by John Fox.
An R Companion to Applied Regression, by John Fox and Sanford Weisberg.

Course Prerequisite: STAT:2010 or STAT:2020 or STAT:3120.

Students should have had relatively comprehensive training in fundamental statistics, e.g., fundamental knowledge and understanding of probability, distribution, random variable, discrete and continuous distributions, sample and population, statistics and parameters, point estimation, confidence interval, hypothesis tests such as one-sample and two-sample problems, and correlation. No prior knowledge of R computing is required.

Course Description and Objectives: Regression analysis with focus on methodology and theoretical background, applications and hands-on data analysis with computer software (primarily R). In this course, students learn strategies to handle various types of data analysis and theoretical reasoning behind, and meanwhile the use of R to aid computations.

Upon completion of the course students are expected to

- acquire strong foundation in classical methods required for analysis of various data types, including modelling, estimation, inference, computation and interpretation/delivery of statistical findings;
- have a good understanding of theoretical foundation and reasoning behind methodology and applications;

- be able to conduct comprehensive and thorough data analysis using classical methods;
- gain critical thinking in data analysis and be able to evaluate or improve data analysis.

R Software: Computing using R is taught and required throughout the semester. R lab sessions will be announced in class in advance and incorporated into lectures.

R is open-source statistical software—one the most popular and powerful for data analysis. It is freely available at *https://www.r-project.org/* and can be downloaded to personal computer for free use. It is also available on the university Virtual Desktop and at the Instructional Technology Centers (ITCs) such as 41 SH.

Homework: Regular homework will be assigned periodically in ICON; assignments are 1 to 1.5 weeks long. Students will turn in their assignment using file upload in ICON by its due date and time. Please submit your homework in Word doc, pdf files, or clear, readable scans/images of reasonable size. Please double check your submission each time—points will be deducted if submission cannot be opened or read, or has wrong files or missing pages. All homework assignments are essential, vital practices and will be counted towards overall grade.

Most homework are like mini projects with my step-by-step instructions to combine modeling, theory, methods, and computation to conduct comprehensive hands-on data analyses. Students are highly recommended to learn and practice statistical thinking via these assignments.

Unless prior or prompt arrangements are made for reasons judged to be acceptable by Prof. Li, homework turned in after it is due will receive 0 (zero) credit. Homework submitted via email to me or grader won't be accepted/graded. Additionally, as answer keys will be posted soon after an assignment is graded, late homework submission will only be considered in exceptional circumstances and with prior or prompt notification.

Students are allowed to discuss homework assignments, but every student is responsible for submitting their own work, reflective of their own effort (write up their own individual answers and do their own computing). If "blind copying" in a student's answer sheets is identified, all involved students will receive zero score and be considered as plagiarism. Discussions among students can be posted on the ICON Discussion Boards; notice that Discussion Board posts are public that everyone in the class will be able to read all of the posts and responses, and respond to them.

Low-stakes Quizzes: There are 3 small quizzes; prior to an exam, an online quiz will be given in ICON as a practice and discussed in class.

Exams:

Midterm 1	Wednesday October 8, 3:30-4:20 pm
Midterm 2	Wednesday November 12, 3:30-4:20 pm
Final Exam	TBA by the University
	moderately comprehensive with emphasis on newer materials.

The following rules apply to all exams and makeups:

- Any unexcused absence from an exam will result in a score of zero with no opportunity for a makeup. A makeup exam will be considered *only* with <u>documentation</u> of reasons required by university policy and under <u>prior or prompt</u> arrangement made with Prof. Li (e.g., no later than the exam day). If a documented excuse is accepted, a makeup exam will be given *as soon as possible.*

    To request a makeup exam, you must provide full, irrefutable, and truthful documentation of a university-approved excuse. Acceptable examples include a doctor's note, a police report for an accident, a pastor's note for a funeral, or a web link to an obituary. The documentation must include your name, indicate a university-approved excuse that conflicts with the exam date, and be subject to verification for authenticity. This policy ensures fair and consistent treatment for all students in the class.

- All exams and makeups will be in-person, proctored, and must be completed on time. Exams not turned-in within the allotted time will not be accepted.

- You can bring <u>one</u> standard letter-size (about 8.5in × 11in) sheet of paper with anything you want written or typed on both sides to each midterm exam, and <u>three</u> such self-prepared help sheets to the final exam. Also bring a scientific calculator (any type) to each exam. Other than these, all exams are closed-book, closed-notes, and no-computer. A review for each exam will be given in class.

- The midterm exams are given at regular class meeting times.

- The final examination date and time will be announced by the Registrar generally by the fifth week of classes. Do not plan your end of the semester travel plans until the final exam schedule is made public. It is your responsibility to know the date, time, and place of the final exam. According to the Registrar's final exam policy, students have a maximum of two weeks after the announced final exam schedule to request a change if an exam conflict exists or if a student has more than two exams scheduled for the same day (see the policy here). See the University Final Exam Policies at *https://registrar.uiowa.edu/final-exam-policies*.

Grading: A numerical overall score on the scale of 0 to 100 will be determined according to

Homework	17%
Low-stakes quizzes	2%
Midterm 1	25%
Midterm 2	25%
Final	31%

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

[100, 90] A+, A; (90, 80] A-, B+, B; (80, 65] B-, C+, C; (65, 50] C-, D+, D, D-; <50 F

At the discretion of Prof. Li, depending on class performance and attendance/participation, these ranges may be adjusted, but only downward—criteria will only become easier, not harder. Plus (+) and minus (-) gradings in each bracket will be given as deemed appropriate. A+ grade will be used to indicate rare and extraordinary academic achievement.

Integrity of Course Materials: I request that you preserve the integrity of the course materials. This means that under no circumstance should you make public (either in print or via web postings, social networks, etc.) or disseminate any course materials such as lecture notes, handouts, assignments, exams, solutions, recordings, reference books, etc. 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: Participation in course activities is very vital to your success in this course. Students are expected to attend all lectures. Roll may be taken 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, smart phones, etc. must be put away during exams.

Comment on AI: AI tools are widely available and sometime useful for learning and practices. However, to learn well and master the course material, you need to study and practice by yourself and don't rely on AI to do assignments for you; it will not be available for use on exams.

Extra Help: A list of Private For-Pay Tutors:
https://stat.uiowa.edu/resources/tutoring

Topics:

1. Introduction to linear regression   Week 1

2. Introduction to R computing   Week 1

3. Examining data   Week 2

4. Transforming data   Week 2-3

5. Review of basic statistics   Week 3

6. Simple linear regression - estimation   Week 4

7. Simple linear regression - inference   Week 4-5

8. Multiple linear regression   Week 5-6

9. Dummy variable regression (ANCOVA)   Week 7-8

10. One-way ANOVA   Week 9-10

11. Two-way ANOVA   Week 10-11

12. Diagnostics of influential data   Week 12

13. Diagnostics of non-linearity, non-constant variance, and non-normality   Week 12

14. Diagnostics of multicollinearity   Week 13

15. Model selection   Week 13

16. Logistic regression   Week 13-14

17. Other topics (e.g., more GLM models, tree models) when time permits   Week 15

Course's College (Administrative Home)
The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the policies and procedures for its courses. Graduate students, however, must adhere to the academic deadlines set by the Graduate College.

Student Complaints
Students with a complaint about a grade or a related matter should first discuss the situation with the instructor and/or the course supervisor (if applicable), and finally with the DEO (Chair) of the department, school or program offering the course. Sometimes students will be referred to the department or program's Director of Undergraduate Studies (DUS) or Director of Graduate Studies (DGS). See the CLAS Student Academic Handbook.
Undergraduate students should contact CLAS Undergraduate Programs for support when the matter is not resolved at the previous level. Graduate students should contact the CLAS Graduate Affairs Manager when additional support is needed.

Drop Deadline for this Course
You may drop an individual course before the drop deadline; after this deadline you will need collegiate approval. When you drop a course, a "W" will appear on your transcript. The mark of "W" is a neutral mark that does not affect your GPA. To discuss how dropping (or staying in) a course might affect your academic goals, please contact your Academic Advisor. Directions for adding or dropping a course and other registration changes can be found on the Registrar's website. Graduate students should adhere to the academic deadlines and policies set by the Graduate College.

Academic Honesty and Misconduct
All students in CLAS courses are expected to abide by the college's standards of academic honesty. Undergraduate academic misconduct must be reported by instructors to CLAS according to these procedures. Graduate academic misconduct must be reported to the Graduate College according to Section F of the Graduate College Manual.
https://clas.uiowa.edu/academics/handbook/standards/academic-honesty

Accommodations for Students with Disabilities
The University of Iowa is committed to providing an educational experience that is accessible to all students. A student may request academic accommodations for a disability (which include but are 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 *http://sds.studentlife.uiowa.edu/* for more information.

Absences from Class
University regulations require that students be allowed to make up examinations which have been missed due to illness, religious holy days, military service obligations, including service-related medical appointments, jury duty, or other unavoidable circumstances or other university-sponsored activities. Students should work with their instructors regarding making up other missed work, such as assignments, quizzes, and classroom attendance.

Absences for Religious Holy Days
The university is prepared to make reasonable accommodations for students whose religious holy days coincide with their classroom assignments, test schedules, and classroom attendance expectations. Students must notify their instructors in writing of any such religious holy day

conflicts or absences within the first few days of the semester or session, and no later than the third week of the semester. If the conflict or absence will occur within the first three weeks of the semester, the student should notify the instructor as soon as possible. See Policy Manual 8.2 Absences for Religious Holy Days for additional information

Absences for Military Service Obligations

Students absent from class or class-related requirements due to U.S. veteran or U.S. military service obligations (including military service–related medical appointments, military orders, and National Guard Service obligations) shall be excused without any grading adjustment or other penalty. Instructors shall make reasonable accommodations to allow students to make up, without penalty, tests and assignments they missed because of veteran or military service obligations. Reasonable accommodations may include making up missed work following the service obligation; completing work in advance; completing an equivalent assignment; or waiver of the assignment without penalty. In all instances, students bear the responsibility to communicate with their instructors about such veteran or military service obligations, to meet course expectations and requirements.

Free Speech and Expression

The University of Iowa supports and upholds the First Amendment protection of freedom of speech and the principles of academic and artistic freedom. We are committed to open inquiry, vigorous debate, and creative expression inside and outside of the classroom. Visit the Free Speech at Iowa website for more information on the university's policies on free speech and academic freedom.

Non-discrimination Statement

The University of Iowa prohibits discrimination in employment, educational programs, and activities on the basis of race, creed, color, religion, national origin, age, sex, pregnancy (including childbirth and related conditions), disability, genetic information, status as a U.S. veteran, service in the U.S. military, sexual orientation, gender identity, or associational preferences. The university also affirms its commitment to providing equal opportunities and equal access to university facilities. For additional information on nondiscrimination policies, contact the Senior Director, Office of Civil Rights Compliance, the University of Iowa, 202 Jessup Hall, Iowa City, IA 52242-1316, 319-335-0705, ui-ocrc@uiowa.edu. Although not required, students have the option to share their pronouns and chosen/preferred names in class and through MyUI. Instructors and advisors can find information about a student's chosen/preferred name in MyUI.

Classroom Expectations

Students are expected to comply with University policies regarding appropriate classroom behavior as outlined in the Code of Student Life. While students have the right to express themselves and participate freely in class, it is expected that students will behave with the same level of courtesy and respect in the virtual class setting (whether asynchronous or synchronous) as they would in an in-person classroom. Failure to follow behavior expectations as outlined in the Code of Student Life may be addressed by the instructor and may also result in discipline under the Code of Student Life policies governing E.5 Disruptive Behavior or E.6 Failure to Comply with University Directive.

Policies on sexual harassment and other policies and resources
https://provost.uiowa.edu/student-course-policies

The policy regarding severe weather
https://opsmanual.uiowa.edu/community-policies/extreme-weather-protocol