STATISTICS 408: Introduction to Linear Models, Spring, 2021.

$$y_i = \beta_0 + \beta_1 x_i + e_i$$

INSTRUCTOR: Dr. Mohsen Pourahmadi
CLASS TIMES: TR 9:45-11:00am, Live Zoom Lectures Starting January 19, 2021.
OFFICE Hours: MW 10:00-11:00 am OR by appointment on Zoom
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Grader: Ms. Rochita Das (rochita.das@tamu.edu)
OFFICE Hours: Thursday, 3-5 pm on Zoom.
Recitation: Tuesday, 3-4 pm on Zoom.
TEXTBOOK: **A Modern Approach to Regression With R**, Simon Sheather, 2009, Springer Texts in Statistics. ISBN: 978-0-387-090607-0, e-ISBN: 978-0-387-09608-7. Electronic copy of the textbook is available for free through TAMU libraries.

PREREQUISITE: Three semesters of calculus and MATH 304 (Linear Algebra and Matrices). Some experience with R programming, and a course in inferential statistics (STAT 212, 641, or 651) are prerequisites for this course. Classes like 630, 610, or 414 are not appropriate prerequisite.

Learning Objectives: $y_i = \beta_0 + \beta_1 x_i + e_i$

By the end of the semester, a student in the course should be able to:

- Explain the goal of regression analysis as discovering relationship among several variables. **Use vectors and matrices in developing the least squares framework for regression analysis.**
- Identify appropriate graphs, summary statistics, models, and inferential statistics used in regression analysis,
- Interpret graphs, statistics, and regression models in various contexts,
- Calculate summary and inferential statistics,
- Compare and contrast various models,
- Create appropriate models for various contexts,
- Infer appropriate conclusions about populations based on data,
- Explain and compare properties of summary and inferential statistics and models,
- Combine concepts in new ways to solve different statistical problems,
- Understand the need and check the assumptions of inference for linear models.

Computer-related Info

- **eCampus/Zoom/GoogleDrive:** Various information, including class notes, assignments, announcements and examples, will be posted at eCampus. eCampus/**Discussion** is a powerful media/resource for staying in touch with your classmates on topics of mutual interest like HWs, R, exams or other developing issues related to the course. *It is your responsibility to check the eCampus daily for announcements.*

- **The Computer Software R:** We will use the statistical software called R, a free software. You will be responsible for (a) understanding data analyses using R and (b) interpreting R output on exams, even if you choose to use different software for homework assignments.

- All computation in the textbook is done using the R software which can be downloaded for free. The data, R code for the textbook examples and errata can be found at

  `http://gattonweb.uky.edu/sheather/book/`

GRADE POLICY:

1. Two midterm exams each worth 25% of the total grades. The first will be on Th February 25th, and the second on Tu April 6th. The final exam (May 5, 8:00-10:30 am)) is worth 30%.

2. Homework and quiz will contribute 20% to the final grade. There will be occasional quizzes in the first half of the semester. They will also serve as test runs for detecting potential Internet/technology problems when using eCampus/Zoom for the midterms and final. The quality of writing HW and logical presentation of the arguments leading to the solution, not just the correct answer, will contribute greatly to the HW grade.

3. You will NOT be allowed any extra credit projects to compensate for a poor average. Everyone must be given the same opportunity to do well in this class. The final course grade will be based on the standard scale where a total of 90 to 100 percent will be an A, 80 to 89 percent will be a B, etc.

4. Attendance, participation during Zoom lectures, posting/answering questions in the Discussion Board are encouraged and will be rewarded They are integral parts of the learning process and greatly enhance the team work spirit which is much needed.

A Tentative Course Outline

Chapter	Topics	Approx. No. Hours
Syllabus, Chap 1	Motivating Examples, Matrices, R	2
Chap 2	**Simple Linear Regression**	10
First Midterm	Th. Feb. 25	
Chap 3	**Diagnostics**	5
Chap 3	**Transformations**	3
Chap 4	Weighted LS	1
Chap 5	**Multiple Linear Regression**	6
Chap 6	Diagnostics and Trans	3
Chap 7	**Variable Selection**	6
Second Midterm	Tu April 6	More details forthcoming
Chap 8	Logistic Regression	4
Chap 9	Time Series Errors	1
Final Exam	May 5	8:00-10:30 am

5. **More on Homework Policy:**

   Homework assignments will be available in the HomeworkAssignments folder on eCampus. Homework solutions must be in a single PDF file. You should be identified on the initial page with your TYPED Name, Course and Email address. Your homework solutions must be your own work, not from outside sources, consistent with the university rules on academic integrity. I expect you to follow this policy scrupulously. Your chances for a good performance on the exams will be higher if you follow this policy. You may use: • Your textbook and notes from class. • Your notes, homework, etc., from a related class that you took or are taking. • References listed on the syllabus. • Discussion with the instructor or grader. • Voluntary, mutual and cooperative discussion with other students currently taking the class. You may not use: • Solutions manuals (printed or electronic) and copies of pages from solutions manuals. • Solutions notes, homework, etc., from previous classes. • Solutions, notes, homework, etc., from students who took this class previously.

6. **More on Exam Policy:**

   Students will take the exams in the classroom under my supervision at the scheduled times. Your exam solutions must be your own work, consistent with the university rules on academic integrity. Each exam will be comprehensive, cumulative and closed book. You will be allowed to use a a common formula sheet I provide. You may use a calculator but it cannot have capability to phone, text, or access Web.

   Makeup Policy:

7. If you missed a homework assignment or exam, see the university rule on Attendance website Rule 7: http://student-rules.tamu.edu/rule07

8. If you fail to submit a homework assignment by the due date because of a univeristy excused absence or due to illness or circumstances beyond your control, notify me in writing or by email (before, if feasible, otherwise within two working days after you return). If your absence is approved, I will notify you on how you may make up the missed assignment.

9. If you must miss an exam because of a univeristy excused absence or due to illness or circumstances beyond your control, notify me in writing or by email (before, if feasible, otherwise within two working days after you return). If your absence is approved, I will notify you on how you may make up the exam.

10. If you miss a homework assignment or an exam and your reason for missing the assignment or exam is not accepted, then you will receive a score of 0 for the assignment or exam.

11. A temporary grade of I (Incomplete) at the end of a semester indicates that the student has completed the course with the exception of a major quiz, final exam, or other work. The instructor shall give this grade only when the deficiency is due to an authorized absence or other cause beyond the control of the student.

    Other Useful Information:

12. STATEMENT ON PLAGIARISM: As commonly defined, plagiarism consists of passing off as one's own ideas, words, writing, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules, under the section "Scholastic Dishonesty." For more details, see the Aggie Honor Code and the website link (http://aggiehonor.tamu.edu).

13. STATEMENT ON DISABILITIES: Americans with Disabilities Act (ADA) Policy Statement - The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information visit http://disability.tamu.edu/. Programs not on main campus should use the appropriate location at their site.

14. Title IX and Statement on Limits to Confidentiality: Texas A&M University and the College of Science are committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws provide guidance for achieving such an environment. Although class materials are generally considered confidential pursuant to student record policies and laws, University employees — including instructors — cannot maintain confidentiality when it conflicts with their responsibility to report certain issues that jeopardize the health and safety of our community. As the instructor, I must report (per Texas A&M System Regulation 08.01.01) the following information to other University offices if you

share it with me, even if you do not want the disclosed information to be shared: Allegations of sexual assault, sexual discrimination, or sexual harassment when they involve TAMU students, faculty, or staff, or third parties visiting campus. These reports may trigger contact from a campus official who will want to talk with you about the incident that you have shared. In many cases, it will be your decision whether or not you wish to speak with that individual. If you would like to talk about these events in a more confidential setting, you are encouraged to make an appointment with the Student Counseling Service (https://scs.tamu.edu/). Students and faculty can report non-emergency behavior that causes them to be concerned at http://tellsomebody.tamu.edu.

15. Statement on Mental Health and Wellness: Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

16. **Copyright Notice:** The handouts used in this course are copyrighted. By handouts, I mean all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission.