

Syllabus for STAT 3301: Statistical Modeling for Discovery I
Autumn 2024 – 3 credit hours

Instructor: Dr. Andrew Richards
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Office Hours: TBD
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Course meeting times and locations: MWF 10:20-11:15pm or 11:30-12:25 in Pomerene 150

Prereq: C- or above in 3202; or 4202 and 5730; or permission of instructor. Prereq or concur: Math 2568, or permission of instructor.

Required Text: *Applied Linear Regression*, Fourth Edition (2014) by Sanford Weisberg.

An electronic version of the text can be accessed for free through The Ohio State University Libraries at <https://library.ohio-state.edu/record=b7651844~S7>. You will need to click on “Connect to resource EBSCOhost”; you may also need to supply your OSU credentials. The online resource is best suited for screen reading; each individual is allowed to print/e-mail/save/download a limited number of pages.

Website: Please visit <http://www.carmen.osu.edu/>. Carmen is used extensively for this course, so you should check daily for announcements about the class and other class material. Contact the IT Service Desk at 614-688-4357 (HELP) for help with access.

Course Description: Statistical models for data analysis in the linear regression framework. The challenges of developing meaningful models for data are explored, with emphasis on the model building process, the use of numerical and graphical diagnostics for assessing model fit, and interpretation and communication of results. Statistical foundations are introduced along with basic inferential techniques.

Learning Outcomes: By the end of this course, students should successfully be able to:

- Use graphical and numerical summaries of data to describe relationships between variables.
- Formulate, fit, evaluate, and compare regression models that describe relationships between variables.
- Understand and be able to describe the statistical foundations of standard regression models.
- Identify common violations of the assumptions that underly standard regression models.
- Perform a complete regression analysis and communicate the results in both statistical and problem-specific terms.
- Distinguish between descriptive and causal interpretations of regression.

Homework:

Description: There will be nine homework assignments. Homework problems that require R software should be completed in R Markdown and a knitted html file should be uploaded. Homework problems that do not require R may be handwritten (electronically, or on paper and scanned) and uploaded to Carmen by the due date. **All work and software output must be uploaded as a single pdf file.**

Academic integrity and collaboration: The purpose of the written homework is to assess and provide feedback on your understanding. **Therefore, answers with little or no explanation or work shown will receive no credit.** For the homeworks as well the exams, your solution should be clear and detailed to explain your understanding of the course.

While grading the homeworks, it may not be possible for us to provide detailed explanations on each question that is graded. To make up for this, I will endeavor to create homework solutions that are detailed enough to allow you to understand how the question could be approached. You may consult with other students, however, **the work submitted must be your own.**

Data analysis assignment:

Description: here will be an individual, comprehensive data analysis project that will be completed by the end of the semester. Expect details on the project to be posted in early November.

Academic integrity and collaboration: The data analysis project is individual and should be treated as such. It should be completed **without any external help or communication.** Sharing of code or other discussion between students is **strictly prohibited.**

Exams:

Description: There will be two midterm exams and one final exam. The midterms will be held during lecture on the dates listed in the schedule.

Academic integrity and collaboration: You must complete the midterm and final exams yourself, **without any external help or communication.** **Again, answers with little or no explanation or work shown will receive no credit.** Students are **strongly advised** to prep a formula highlight sheet in advance.

Late assignments policy:

Assignment solutions will be posted shortly after the submission deadline. No late assignments will be accepted without **prior permission** and/or **formal documentation.** Please refer to Carmen for due dates. Accommodations can be made in case of severe illness, so please notify me as soon as possible if this situation arises. Deadlines are crucial in order, among other things, to:

- Get grading done and provide feedback in a timely manner
- Grade all assignments at the same time to maintain consistency and fairness
- Provide a mechanism to help ensure students keep up with the material and are prepared for follow-on lectures
- Protect students from their inability to predict their own future behavior – “I’ll somehow manage to catch up at the end of the semester.”

Course attendance policy: **You are expected to attend all lectures.** Formal attendance records will not usually be kept, and students are responsible for all material covered in class. I intend to simulcast lectures on zoom and record them, however, **I am not responsible for the quality of these recordings**

and these recordings will continue only if attendance and exam scores remain adequate. Exams must, of course, be taken in person. Office hours should not be used for instruction on material that has already been covered in class.

Course technology: Students are expected to have a basic working knowledge of The Microsoft Office software. All Ohio State students are now eligible for free Microsoft Office 365. Visit the go.osu.edu/office365help help article for full instructions.

Final Grade: Your final course grade will be based on the following weighting of assessment components:

Category	Percentage
Homework	20
Data analysis assignment	15
Exam 1	20
Exam 2	20
Final exam	25
Total	100

Grading Scale:

Grades will be assigned according to the scale below, with course components weighted as listed above.

- 93-100 = A
- 90-92.9999 = A-
- 87-89.9999 = B+
- 83-86.9999 = B
- 80-82.9999 = B-
- 77-79.9999 = C+
- 73-76.9999 = C
- 70-72.9999 = C-
- 67-69.9999 = D+
- 60-66.9999 = D
- < 60 = E

E-mail Correspondence: In order to protect your privacy, all course email correspondence must be done through a valid OSU name.nn account. Please use the correct email address. (Richards.1227@osu.edu **not** @buckeyemail.osu.edu). Please write “STAT 3301” somewhere in the subject line, as this will help me to quickly identify and reply to class emails. It is reasonable to expect a response within one business day.

Academic Misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Special Accommodations: The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I

may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious Accommodations: Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Office of Institutional Equity. (Policy: Religious Holidays, Holy Days and Observances)

Other information: Other standard university boilerplate can be found here: <https://asccas.osu.edu/curriculum/syllabus-elements>.

Copyright: The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Disclaimer:

The planned instruction for this course may be disrupted for a number of reasons. Such disruptions may affect individual students for a brief period of time, the entire class, the instructor, or the entire university. If the class is disrupted, we will adjust as needed. The adjustments may include changes to course delivery, assignments, grading of assignments, and determination of final course grade. Please pay special attention to announcements in class and over Carmen. **Failure to address every possible scenario in this syllabus does not override your responsibility to exercise basic common sense. If in doubt about any course policy, ask in advance!**

Acknowledgemnt:

Thank you to Dr. Stephanson Anthonyimuthu for his kind sharing of advice and course materials in preparation for this semester.

Tentative Course Schedule

Week	Dates	Topics
1	8/21-8/23	Intro and R basics
2	8/26-8/30	Intro to SLR
3	9/2-9/6	SLR Estimation and fitted values
4	9/9-9/13	SLR Inference and prediction
5	9/16-9/20	R^2 , diagnostics
6	9/23-9/27	Diagnostics and transformations
7	9/30-10/4	Intro to MLR
8	10/7-10/11	MLR model fitting
9	10/14-10/18	MLR properties and testing
10	10/21-10/25	MLR intervals and diagnostics
11	10/28-11/1	Categorical predictors
12	11/4-11/8	Interactions
13	11/11-1/15	Multifactor models
14	11/18-11/22	Model comparison and selection
15	11/25-11/29	Cross validation
16	12/2-12/4	Stepwise and nonlinear regression

Holidays:

- Labor Day 9/2
- Fall Break 10/11
- Veterans Day 11/11
- Thanksgiving 11/27-11/29

Projected exam dates:

- MT1 9/25
- MT2 11/1
- Final 12/10 6:00-7:45pm in **Pomerene 160**