



湖北工业大学
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Applied Regression Analysis
Course Code	STAT 3441
Semester	Winter 2026
Course Length	5 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	MATH 1112 Calculus II STAT 2191 Introduction to Statistics

Course Description:

This course provides a comprehensive introduction to statistical modeling using regression and analysis of variance. Beginning with simple regression and progressing to multiple regression, students learn how to construct, interpret, and evaluate statistical models in real-world applications. Emphasis is placed on model diagnostics, assumption checking, and the proper use of ANOVA for both regression and basic experimental designs. The course also introduces methods for working with categorical predictors and provides practice in applying statistical software to analyze data sets.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical Thinking Skills** – Students will engage in analytical thinking, demonstrating the ability to critically evaluate, synthesize, and apply knowledge to complex problems, and construct well-reasoned solutions and arguments.
- **Independent Research and Inquiry** – Students will conduct independent research, utilizing academic resources to explore relevant topics, formulating research questions, analyzing data, and presenting findings in a coherent, scholarly manner.
- **Problem-Solving and Application** – Students will apply theoretical concepts and methodologies learned in the course to real-world problems, demonstrating the ability to develop practical solutions informed by academic inquiry.
- **Global and Cultural Awareness** – Students will gain awareness of the global and cultural contexts relevant to the course, appreciating diverse perspectives and considering the implications of their studies in a broader, international context.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Fit and interpret simple and multiple linear regression models using the least squares approach;
- Conduct hypothesis tests and construct confidence intervals for regression parameters;
- Apply residual analysis and diagnostic tools to assess the adequacy of fitted models;
- Use analysis of variance to evaluate regression models and designed experiments;
- Incorporate indicator variables to handle categorical predictors in regression;
- Compare and select models using appropriate statistical criteria;
- Communicate findings from regression analysis clearly, both graphically and in written form;
- Demonstrate competence in using statistical software to implement regression procedures.

Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:

Required Textbook: Kutner, Nachtsheim, Neter & Li, *Applied Linear Statistical Models*, 5th Edition, McGraw-Hill Irwin.

Optional: Julian J. Faraway, *Linear Models with R*, 2014. CRC Press.

Technical Requirements:

R will be the primary statistical software. Students are required to install the most recent version of R and RStudio (desktop edition). Students are welcome to use other software for assignments (such as SAS, SPSS, minitab, etc), however R is strongly encouraged. A working laptop capable of running R and RStudio is required for labs, homework, and project work.

Course Requirements:**Assignments**

Assignments will consist of a mix of theoretical problems and applied case studies. Students will be expected to solve algebraic exercises on regression theory, interpret computer output from R, and produce plots or diagnostics to evaluate models. Each assignment will reinforce concepts covered in class and provide hands-on practice with real or simulated datasets. Assignments also serve to build familiarity with coding in R and reporting results in clear, reproducible formats.

Midterm Exam

The midterm examination will test both conceptual understanding and practical application of regression and ANOVA methods introduced in the first half of the course. Questions will include short proofs, computational exercises, interpretation of R outputs, and multiple-choice or short-answer problems. The exam ensures that students can demonstrate mastery of foundational regression analysis before moving on to more advanced topics like model selection and categorical predictors.

Data Analysis Project

The project requires students to carry out a complete regression-based data analysis on a dataset assigned by the instructor. Students will identify appropriate predictors, fit models, perform diagnostics, refine models, and communicate results in a formal written report.

Final Exam

The final exam is comprehensive, covering material from the entire course. It will test the ability to fit, interpret, and critique linear regression and ANOVA models, evaluate diagnostics, and use regression for categorical predictors.

Assessments: Activity	Percent Contribution
Assignments	25%
Midterm Exam	25%
Data Analysis Project	20%
Final Exam	30%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	Percentage of available points
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:

The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

STAT 3441 Schedule		
Lecture	Topic	Readings
L1	Course intro; role of regression; R setup	Ch. 1
L2	Simple regression; least squares	Ch. 1
L3	Properties of estimators, variance decomposition, coefficient of determination	Ch. 1
L4	Inference in simple regression: confidence intervals, hypothesis tests for parameters	Ch. 2
L5	Prediction of new observations; ANOVA for regression; model fit	Ch. 2
L6	Residuals; lack-of-fit tests	Ch. 3
L7	Outliers, leverage, influence	Ch. 3
L8	Remedial measures; goodness-of-fit	Ch. 3
L9	Simultaneous inference	Ch. 4

L10	Matrix formulation of regression; least squares in matrix terms	Ch. 5
L11	Transition to multiple regression; interpretation with multiple predictors	Ch. 6
L12	Hypothesis testing in multiple regression	Ch. 6
L13	Collinearity and its consequences	Ch. 7
L14	Polynomial regression	Ch. 7
/	Midterm Exam	/
L15	Regression with categorical predictors (indicator variables)	Ch. 8
L16	Regression with mixed quantitative and qualitative predictors	Ch. 8
L17	Model selection: criteria	Ch. 9
L18	Model selection: stepwise procedures	Ch. 9
L19	Advanced diagnostics; multicollinearity	Ch. 10
L20	Remedial measures: transformations, weighted regression, ridge regression	Ch. 11
L21	Logistic regression	Ch. 14
L22	Poisson regression and generalized linear models (introductory treatment)	Ch. 14
L23	Introduction to ANOVA and the design of experiments	Ch. 15
L24	Single-factor ANOVA models and interpretation	Ch. 16
L25	Diagnostics for ANOVA models; model adequacy checks	Ch. 18
	Project Report Submission	
/	Final Exam	/

Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or outside the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will

show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work

The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs, and Disabilities

Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.