

Text: Applied Linear Regression Models, by Kutner, Nachtsheim, and Neter; Fourth Edition, McGraw-Hill/Irwin Publishers, 2004.

Instructor: Dr. Majid Jaridi (Majid.Jaridi@mail.wvu.edu)
Room 341 ESB. Phone (304) 293-4099

Office Hours: 10:00 – 12:00 Tuesday, Thursday or by appointment

Course Description

Introduction to linear statistical models. Design and analysis of simple experimental configurations frequently occurring in engineering studies. Similarities and differences between regression and experimental design models emphasized in a vector-matrix setting.

Prerequisite

Engineering Statistics (IENG-213) or equivalent.

Course Goals

1. To provide students with the basic concepts of linear regression and analysis of variance, and techniques to apply them to appropriate data sets.
2. To provide students with knowledge on the use of software to solve statistical analysis problems.
3. To provide students with hands-on experience in the application of linear regression and analysis of variance.

Student Learning Objectives

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (ABET Outcome #1)
 - a) The key abilities the students will acquire are as below.
 - i. Confidence intervals and hypothesis testing
 - ii. Regression analysis
 - iii. Analysis of variance
 - iv. Learn and use statistical software packages
 - v. Ability to apply matrix algebra for regression analysis
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (ABET Outcome #2)
 - a) The key abilities the students will acquire are as below.
 - i. Using data from applied regression analysis solving complex engineering problems.
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (ABET Outcome #6)
 - a) The key abilities the students will acquire are as below.

- i. Analyze and interpret data using statistical inferences

Performance Indicators

The student performance indicators that are associated with the key abilities are:

1. Recognize problems that can be solved using linear regression and analysis of variance.
2. Perform simple and multiple regression analysis, both manually and using statistical packages.
3. Perform statistical inferences related to regression analysis.
4. Perform appropriate tests to check the aptness and the assumptions of the regression model, diagnose problems, and take remedial actions (e.g., variable transformation, and weighted least squares).
5. Know how to handle qualitative predictor variables. Work with stepwise regression. Evaluate regression models using different criteria, identify outliers, and influential cases.
6. Perform one-factorial analysis of variance (both fixed and random effect models), understand the assumptions of ANOVA, how to test for them, and the remedial measures.

Course Contribution to Professional Component

Engineering topics 33%; Basic math and science topics 67%. This course has a significant design content.

WEEK	TOPIC	READING
1.	Introduction and Review of Basic Statistics	Appendix A
2.	Linear Regression with one Predictor Variable	Chapter 1
3.	Inferences in Regression and Correlation Analysis	Chapter 2
4.	Inferences in Regression and Correlation Analysis	Chapter 2
5.	Diagnostics and Remedial Measures	Chapter 3
6.	Simultaneous Inferences and Other Topics	Chapter 4
7.	<u>TEST I</u> Matrix Approach to Simple Linear Regression Analysis	Chapter 5
8.	Multiple Regression: Part I	Chapter 6
9.	Multiple Regression: Part II	Chapter 7
10.	Spring Recess	
11.	Regression Models for Quantitative and Qualitative Predictors	Chapter 8
12.	Building Regression Models I:	

	Model Selection and Validation	Chapter 9
13.	Building Regression Models II: Diagnostics	Chapter 10
14.	Building Regression Models III: Remedial Measures <u>TEST II</u>	Chapter 11
15.	Analysis of Variance	TBA
16.	Analysis of Variance	TBA

Final Test: Tuesday, May 5th, 8:00 a.m. to 10:00 a.m.

General Policies

1. All assigned problems will be collected and graded. Late homework will not be accepted.
2. Makeup tests will not be given. Incomplete grades will not be given except as allowed by university policy.
3. No credit will be given for attendance. However, class participation is highly encouraged and will affect the final grade in borderline cases.
4. Students must bring the text to class for reference.
5. Group work is allowed and encouraged on homework.
6. Cell phones and all other communication devices must be turned off during class and tests.

Grading Policies

Test I	25
Test II	25
Homework	10
Final Test	<u>40</u>
	100

Tentative Grading Basis

$\geq 90\%$	A
80% -- 89%	B
70% -- 79%	C
60% -- 69%	D
< 59%	F

Exams

All examinations will be closed book and closed notes. However, you are allowed to bring one sheet containing formulas that you might want to use on the test. All work must be shown in order to receive full credit, and instructions should be followed in order to avoid point deductions.

Academic Standards Policy, including Academic Dishonesty

Effective the beginning of the Fall 2019 semester, all students at West Virginia University – unless specifically exempted – are subject to the new WVU Policy on Student Academic Integrity. Students should familiarize themselves with the policy and associated procedures via the Academic Standards Resources website. You can also contact the Office of Academic Integrity at (304) 293-8111 or AcademicIntegrity@mail.wvu.edu for more guidance on the application of the policy and your individual rights. The new policy was developed to 1) provide for greater consistency in treatment around charges of academic integrity violations, 2) streamline the process and provide for a more timely resolution, and 3) afford students full rights under relevant case law.

Campus Safety Statement

The WVU Police are committed to creating and maintaining a safe learning environment for all students, faculty, and staff. Part of this mission includes educating the campus community on how to respond to potential campus threats, such as the threat of an active shooter on campus or other suspicious behaviors. Fortunately, WVU Police offer training - both online and in-person - on how to handle a variety of campus safety scenarios. All students are encouraged to visit the WVU Police (<https://police.wvu.edu/>) webpage, in particular, the content under the Active Shooter (<https://police.wvu.edu/training>) training program. Students are also encouraged to report any suspicious behaviors on campus using the Report a Threat (<https://police.wvu.edu/emergencymanagement/threat-assessment>) portion of the webpage. Additional materials on campus safety prepared by WVU Police, including special safety tips and training, will also be provided on our eCampus page.

Inclusivity Statement

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in your classes, please advise your instructors and make appropriate arrangements with the Office of Accessibility Services. (<https://accessibilityservices.wvu.edu/>) More information is available at the Division of Diversity, Equity, and Inclusion (<https://diversity.wvu.edu/>) as well.

Incomplete Policy

The WVU Catalog contains the full Incomplete Policy.

Sale of Course Material Statement

All course materials, including lectures, class notes, quizzes, exams, handouts, presentations, and other course materials provided to students for their courses are protected intellectual property. As such, the unauthorized purchase or sale of these materials may result in disciplinary sanctions under the Student Conduct Code. (<https://studentconduct.wvu.edu/policies-and-procedures>).

Sexual Misconduct Statement

West Virginia University does not tolerate sexual misconduct, including harassment, stalking, sexual assault, sexual exploitation, or relationship violence [BOG Rule 1.6]. It is important for you to know that there are resources available if you or someone you know needs assistance. You may speak to a member of the university administration, faculty, or staff; keep in mind that they have an obligation to report the incident to the Title IX Coordinator. (<https://titleix.wvu.edu/staff>)

If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Carruth Center, 304-293-9355 or 304-293-4431 (24-hour hotline), and locally within the community at the Rape and Domestic Violence Information Center (RDVIC), 304- 292-5100 or 304-292-4431 (24-hour hotline). For more information, please consult WVU's Title IX Office (<https://titleix.wvu.edu/confidentialresources>).

Student Evaluation of Instruction Statement

Effective teaching is a primary mission of West Virginia University. Student evaluation of instruction provides the university and the instructor with feedback about your experiences in the course for review and course improvement. Your participation in the evaluation of course instruction is both strongly encouraged and highly valued. Results are strictly confidential, anonymous, and not available to the instructor until after final grades are released by Admissions and Records. Information about how you can complete this evaluation will be provided by your instructor.