Course: **IENG 314 – Advanced Analysis of Engineering Data**

Semester: Fall 2019; Monday & Wednesdays, 12:00 – 1:15 pm; ESB G-83

Number of credit hours: 3

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

Prerequisite: IENG 213

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

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https://calendly.com/krcurrie

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. l) Evaluate regression models using different criteria. m) Identify outliers, and influential cases
6. Perform one-factorial analysis of variance (both fixed and random effect models) p) Understand the assumptions of ANOVA, how to test for them, and the remedial measures.

Course Topics:
- Review of Basic Statistics Relevant to Regression and Analysis of Variance (1 week)
- Linear Regression with One Independent Variable (1 week)
- Inferences in Regression Analysis (2 weeks)
- Diagnostics and Remedial Measures (1 week)
- Matrix Approach to Simple Regression Analysis (2 weeks)
- Multiple Regression (2 weeks)
- Polynomial Regression (1 week)
- Building the Regression Model (1 week)
- Diagnostics and Remedial Measures (1 week)
- Qualitative Predictor Variables (1 week)
- Analysis of Variance (2 weeks)

Course Contribution to Professional Component:
Engineering topics 33%; Basic math and science topics 67%. This course has significant design content.

Grading:	Range	Grade
	97 – 100	A+
	93 – 96	A
	90 – 92	A-
	87 – 89	B+
	83 – 86	B
	80 – 82	B-
	77 – 79	C+
	73 – 76	C
	70 – 72	C-
	67 – 69	D+
	63 – 66	D
	60 – 62	D-
	0 – 59	F

- Exam #1 – Wednesday, September 25th, 2019 – 24%
- Exam #2 – Wednesday, October 30th, 2019 – 24%
- Design Project Milestones   – Monday, September 30th, 2019 – 6%
  – Monday, December 2nd, 2019 – 15%

(There is a one-week grace period for each of the project milestones and it coincides with the start of class on the due date. Once the grace period has expired, late submissions will face 10% reductions for every 24-hour period that it is late.)

- Final Exam – Wednesday, December 18th, 2019; 2:00 pm – 4:00 pm – 25%
- In-Class Quizzes (3)– 6%
- Out-of-class participation – Up to 2% extra added to the lowest test score between Exam #1 or #2; Amount extra is based on 1 or 2 out-of-class participation events such as Trunk-or-treat, IISE meetings, Advisory Committee meeting on Friday, October 4th (time to be determined), Alumni Academy Banquet, Friday, October 4th from 6:00 – 8:00 pm, etc.

Statement on Attendance:

The WVU Catalog contains the full Attendance Policy. In this class there is a significant amount of material to cover and it has been shown that there is a strong correlation to student absences and poor performance in the class.

Attendance will be taken at the beginning of class and if you are not in your seat at 12:00 pm or miss a significant portion of the class you will be marked absent. Students will be allowed three unexcused absences. Unexcused absences beyond the first three will result in a 1% reduction in your overall grade for each absence beyond these three unexcused absences.

Exams:
All examinations will be **closed book** and **closed notes with the exception of an instructor provided equation sheet with statistical tables.** All work must be shown in order to receive full credit, and instructions should be followed in order to avoid point deductions. There will be **no makeup exams**. However, if you miss one of the first two exams due to serious illness (documented) or serious family emergency (documented), then you will take a **cumulative final exam**. More specifically, if a student misses an exam, the student must email me explaining why they will miss (or have missed) the exam within 24 hours before (or after the exam). There is no makeup (cumulative final) exam without a proper and certified excuse. The regular final exam will be a 75-minute exam covering the most recent topics. In contrast, the **cumulative final exam** will be a 2-hour exam covering all topics. If you miss both of the first two exams, you will receive a zero on one of the exams and will need to take the cumulative final exam to make up for the other one. If you miss only the final exam, you will be required to take the cumulative final exam.

Communication:
The WVU MIX email system will be used for all communication. The students are responsible for checking their MIX email regularly for information regarding assignments, lecture information, and any other important course related information. Students may be asked to print out information from the attachment in their email and bring it to class. Not all material will be sent in electronic form. Some material only in the form of hard copies will be distributed in class.

Class Schedule:

Week	Topic	Reading
August 21st	Review of basic statistics/ Linear regression w/ one var.	Videos of IE 213
August 26th	Linear regression/ Inferences in regression analysis	Ch.1
September 9th	Inferences in regression analysis	Ch.2
September 16th	Diagnostics and remedial measures	Ch.3
September 25th	**Exam #1**	Ch.4
September 30th	Matrix Approach to Simple Regression Analysis	Ch.5
October 7th	Matrix / Multiple Regression	Ch.6
October 14th	Multiple Regression	Ch.7
October 21st	Polynomial Regression	Ch. 8
October 30th	**Exam #2**	
November 4th	Categorical Predictor Variables	Ch. 8
November 11th	Building the regression model-Model selection	Ch.9
November 18th	Analysis of Variance	TBA
THANKSGIVING BREAK		
December 2nd	Analysis of Variance	TBA
December 9th	Analysis of Variance; Review for Final	TBA

Final Exam: Wednesday, December 18th 2:00 – 4:00 pm

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 orAcademicIntegrity@mail.wvu.edu for more guidance on 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 more timely resolution, and 3) afford students full rights under relevant case law.

Adverse Weather Statement

In the event of inclement or threatening weather, everyone should use his or her best judgment regarding travel to and from campus. Safety should be the main concern. If you cannot get to class because of adverse weather conditions, you should contact your instructor as soon as possible. Similarly, if I am unable to reach the class location, I will notify you of any cancellation or change as soon as possible, using agreed upon methods to prevent students from embarking on any unnecessary travel. If you cannot get to class because of weather conditions, I will make allowances relative to required attendance policies, as well as any scheduled tests, quizzes, or other assessments. [adopted 9-8-2014]

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/emergency-management/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. [adopted 10-2-17]

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. [adopted 2-11-2013]

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) [adopted 5-11-2015]

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 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/confidential-resources).

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 provided by your instructor. [adopted 4-14-2008]

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Date: 08/21/2019