IE 533: Industrial Applications of Statistics
CRN:
Spring 2020

Instructor

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Teaching Assistant

Name
Email:
Office:
Office Hours:

Course Information

Course Format: Lecture and Distance
Classroom: Wang Hall 2599
Dates: 1/13/2020 - 5/9/2020
Time: T/TH 4:30 – 5:45 PM
Credit Hours: 3
Website: Blackboard (course material), Piazza (discussion)

Course Description

The application of statistics to the effective design and analysis of industrial studies relating to manufacturing and human factors engineering in order to optimize the utilization of equipment and resources. Emphasis on conducting these studies at the least cost.

Prerequisites

IE330 or STAT511.

Learning Objectives

- Understand and be able to apply fundamental concepts of experimental design.
- Be able to design an experiment using a variety of designs.
- Be able to analyze data using appropriate statistical methodology for a given experimental design.
- Be able to interpret results from analysis of experimental design.
- Be familiar with at least one professional statistical software program as it relates to experimental design.

Text and Software

Required Texts

Design and Analysis of Experiments, 8th or 9th Edition, Wiley, ISBN: 9781119320937

Statistical Software

Minitab or other professional statistical software (Excel would not count). Demonstrations will be done using Minitab. Minitab is available via go remote at https://goremote.itap.purdue.edu/vpn/index.html. A student copy of Minitab can be purchased via https://www.itap.purdue.edu/shopping/software/student.html for a discount. Using a local copy has a tendency to run into less technology issues than remote access.

Policies

General Course Policies

- Students have the responsibility to manage their time, keep up with readings and exercises, and complete assignments by the due date.
- Deadlines for assignments will be strictly enforced.
- You are expected to read your @purdue.edu email.
- The instructor will be available by email, piazza, or phone if you have questions or need help. Usually I can respond the same day, however it may take a day or two to respond if I am tied up with research projects or other responsibilities.

Course Format

Classes will be a mixture of lecture and discussion/exercises, and demonstration of software and interpreting results.

Course Requirements

Readings	Chapters in the text will cover statistical topics in depth.
Lecture and discussion	Lectures will introduce the statistical and experimental design concepts and techniques. Discussion, activities, and examples will center on illustration.
Statistical and Experimental Design application	Students will learn statistical and experimental design skills by applying concepts on simulated data from engineering examples using Minitab or other professional software through homeworks (guided) and final project (open).
Exams	In class exams will test knowledge of experimental design and analysis, including: when to use designs, properties of designs, when to use certain

	analysis techniques, checking analysis assumptions, and interpreting output.

Assignments should be submitted through Blackboard. They will include:

- Documents with summary of experimental design and statistical results and interpretation (MS Word documents, single-spaced, Times New Roman 12-point font).

Points and Grading

Graded Assignments	#	Maximum Points/Exercise	Total Maximum Points
Homework	8	5	40
Exams	2	20	40
Final Project	1	20	20
Total			100*

*Minimum of 100 points (numerator) will be available to be earned towards a final grade (denominator of 100). Opportunities to earn additional points (numerator) by completing extra objectives may be available throughout the semester.

Grade = Percentage of Total Points
A=90%-100%
B=80%-89%
C=70%-79%
D=60%-69%
F=<59%

Keeping Pace with the Course and Assignments

It is crucial that you keep up with weekly activities in order to be successful in this course. The course covers a great deal of material at a rapid pace. Students are responsible for following along with the syllabus and reading relevant material. You should complete homework by the due date, reviewing it when it is posted will aid you in optimizing your attention during lecture.

Since this is a 3-credit hour course, you should plan to spend 10-15 hours per week reading and applying what you've learned in this course. Each class builds upon the material from the previous sessions. Please address any difficulties with the course material as soon as you are experiencing difficultly.

Class Schedule

Week	Topic	Reading Assignment	HW
1-2	Basic Principles of Experimental Design Statistical Review • Graphical and Numerical summaries • Sums of Squares • Hypothesis Testing • Distributions	Montgomery Chapter 1/2	1
2-4	Single Factor Experiments • ANOVA, model checking, interpretation, sample size, random effects, nonparametric model, multiple testing	Montgomery Chapter 3	2
4-5	Randomized Block, Latin Squares, and Incomplete Design • Purpose/properties, model checking, analysis	Montgomery Chapter 4	3
6-7	Introduction to Factorial Designs • Purpose/properties, model checking, analysis • Two factor and general case, single replicate design	Montgomery Chapter 5	4
7-8	2^k Factorial Design • Purpose/properties, analysis • Two, three, k factors, single replicate design, center points	Montgomery Chapter 6	4
8-9	Blocking and Confounding in the 2^k factorial design	Montgomery Chapter 7	5
9-10	Two level fractional factorial design	Montgomery Chapter 8	5
12	Response Surface Methods and Designs	Montgomery Chapter 11	6
13	Taguchi Designs	Montgomery Chapter 12	7
13-14	Experiments with Random Factors	Montgomery Chapter 13	7

14-15	Nested and Split Plot Designs	Montgomery Chapter 14	8
15	Other Topics • Box-Cox Transformations • Generalized Linear Models • ANCOVA	Montgomery Chapter 15	8

POLICIES

Academic Dishonesty

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, University Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

"Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern."

Purdue Honors Pledge: "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

Instructor's Policy: Evidence of dishonesty on an assignment will result in zero points for that assignment. Evidence of dishonesty on two or more assignments will result in Failure of the course.

Use of Copyrighted Materials

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-

commercial purposes reasonably arising from enrollment in the course or the University generally.

Notes taken in class are, however, generally considered to be "derivative works" of the instructor's presentations and materials, and they are thus subject to the instructor's copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose.

Assignment Deadlines

Students are expected to complete assignments by the deadline. Only the instructor can excuse a student from a course requirement or responsibility. When late assignments can be anticipated, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email, or by contacting the main office that offers the course. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, the student or the student's representative should contact the Office of the Dean of Students,

Grief Absence Policy for Students

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student's family.

Missed or Late Work

Barring permission of the instructor or emergency circumstances (described above), students will receive zero (0) points on missed or late assignments.

Attendance

Attendance is expected, but not required. Midterms will be taken in class for those in the on campus section.

Violent Behavior Policy

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

Students with Disabilities

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

Emergencies

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Here are ways to get information about changes in this course. Black Board web page, my email address: zhass@purdue.edu, and my office phone: 765-494-4020.

Mental Health

If you find yourself beginning to feel some stress, anxiety, and/or feeling slightly overwhelmed, try WellTrack, https://purdue.welltrack.com/ Sign in and find information and tools at your fingertips, available to you at any time.

If you need support and information about options and resources, please see the Office of the Dean of Students, http://www.purdue.edu/odos, for drop-in hours (M-F, 8 am- 5 pm).

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Nondiscrimination

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue's nondiscrimination policy can be found at http://www.purdue.edu/purdue/ea_eou_statement.html.

NOTE: This syllabus is subject to change. Any changes will be posted in the Blackboard Online Learning System.