

University of Texas at El Paso
IE 5352 – Design and Analysis of Industrial Experiments
Fall-2017 Syllabus

Instructor:	Jaime Sanchez, Ph. D.												
How to Reach:	Office: E201-J Office Tel: 747-6394 E-mail:jsanchez21@utep.edu												
Office Hours:	Tuesday from 9:00 to 10:20 am, Wednesday from 5:00 to 5:50 pm and Thursday from 12 noon to 1:30 pm or By Appointments												
Prerequisite:	IE 4385 Statistical Quality Control & Reliability												
Textbook:	DESIGN AND ANALYSIS OF EXPERIMENTS. Eighth Edition, by Montgomery, D. C. Wiley ISBN 978-1-1181-4692-7												
Software:	Minitab												
Objective	To Understand the basic concepts about design and analysis of experiments and apply those in order to draw conclusions and make inference about industrial systems based on the information obtained from well planned experiments in order to improve and optimize products and manufacturing processes.												
Course Description:	The relationship between the scientific method and the DOE is stated at the beginning of the course and is enforced every possible way to show that DOE is the core element of the scientific research. Both design and statistical analysis issues are discussed. Opportunities to use the principles taught in the course arise in all phases of engineering and scientific work, including technology development, new product and process development, and manufacturing process improvement.												
Class Content:	Introduction to DOE Simple Comparative Experiments Completely Random Design with a Single Factor Randomized Complete Blocks and Latin Squares Designs Nonparametric Analysis and Transformations Introduction to Factorial and 2^k Designs Two-Level Fractional Factorial Designs Fitting Regression Models Response Surface Methods and Designs Robust Design												
Grading scheme:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">First exam</td> <td style="text-align: right;">25%</td> </tr> <tr> <td>Second Exam</td> <td style="text-align: right;">25%</td> </tr> <tr> <td>Third Exam</td> <td style="text-align: right;">30%</td> </tr> <tr> <td>Term Project</td> <td style="text-align: right;">5%</td> </tr> <tr> <td>Assignments</td> <td style="text-align: right;">15%</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">100%</td> </tr> </table> <p>Comprehensive Final to improve grade.</p>	First exam	25%	Second Exam	25%	Third Exam	30%	Term Project	5%	Assignments	15%	Total	100%
First exam	25%												
Second Exam	25%												
Third Exam	30%												
Term Project	5%												
Assignments	15%												
Total	100%												
Assignments:	Problems will be assigned during class and will be graded. Assignments will not be accepted after the due date and time.												

University of Texas at El Paso
IE 5352 – Design and Analysis of Industrial Experiments
Fall-2017 Syllabus

Term project	The term project is performed in teams of up to three people. The project consists of planning, designing, conducting and analyzing an experiment, using appropriate DOE principles. Two written interim project reports are required, along with a final written project report. Due dates will be announced during lecture time.
Class Attendance:	Attendance to all sessions is strongly recommended. Students are responsible for all the material covered in class.
Exams:	There will be three exams during the semester, as well as one quiz. Exam dates will be announced in class.
Reading	Students are responsible for reading the material from the textbook previous to the class session.
Plagiarism:	Plagiarism or cheating will not be tolerated. All suspected cases will be treated according to the University Policy..
Accessibility	If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu , or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass .

Topics to Cover

1. Introduction
 - 1.1. Strategy of Experimentation
 - 1.2. Some Typical Applications of Experimental Design
 - 1.3. Basic Principles
 - 1.4. Guidelines for Designing Experiments
 - 1.5. A Brief History of Statistical Design

2. Experiments with a Single Factor: The Analysis of Variance
 - 2.1. The Analysis of Variance
 - 2.2. Analysis of the Fixed Effects Model
 - 2.3. Model Adequacy Checking
 - 2.4. Practical Interpretation of Results
 - 2.5. Sample Computer Output
 - 2.6. Determining Sample Size
 - 2.7. Discovering Dispersion Effects
 - 2.8. The Regression Approach to the Analysis of Variance
 - 2.9. Nonparametric Methods in the Analysis of Variance

3. Randomized Blocks, Latin Squares and Related Designs
 - 3.1. The Randomized Complete Block Design
 - 3.2. Balanced Incomplete Block Designs

University of Texas at El Paso
IE 5352 – Design and Analysis of Industrial Experiments
Fall-2017 Syllabus

4. Introduction to Factorial Designs
 - 4.1. Basic Definitions and Principles
 - 4.2. The Advantage of Factorials
 - 4.3. The Two-Factor Factorial Design
 - 4.4. The General Factorial Design
 - 4.5. The General Factorial Design
 - 4.6. Fitting Response Curves and Surfaces
 - 4.7. Blocking in a Factorial Design

5. The 2^k Factorial Design
 - 5.1. Introduction
 - 5.2. The 2^2 Design
 - 5.3. The 2^3 Design
 - 5.4. The General 2^k Design
 - 5.5. A Single Replicate of the 2^k Design
 - 5.6. 2^k Designs are Optimal Designs
 - 5.7. The Addition of Center Points to the 2^k Design
 - 5.8. Why We Work with Coded Design Variables

6. Two-Level Factorial Designs
 - 6.1. Introduction
 - 6.2. The One-Half Fraction of the 2^k Design
 - 6.3. The One-Quarter Fraction of the 2^k Design
 - 6.4. The General 2^{k-p} Fractional Factorial Design
 - 6.5. Alias Structures in Fractional Factorials and other Designs
 - 6.6. Resolution III Designs
 - 6.7. Resolution IV and V Designs
 - 6.8. Supersaturated Designs

7. Response Surface Methods and Designs
 - 7.1. Introduction to Response Surface Methodology
 - 7.2. The Method of Steepest Ascent
 - 7.3. Analysis of a Second-Order Response Surface
 - 7.4. Experimental Designs of Fitting Response Surfaces
 - 7.5. Experiments with Computer Models
 - 7.6. Mixture Experiments

University of Texas at El Paso
IE 5352 – Design and Analysis of Industrial Experiments
Fall-2017 Syllabus

8. Robust Parameter Design and Process Robustness Studies
 - 8.1. Introduction
 - 8.2. Crossed Array Designs
 - 8.3. Analysis of the Crossed Array Design
 - 8.4. Combined Array Designs and the Response Model Approach
 - 8.5. Choice of Designs