İzmir Institute of Technology
Department of Food Engineering

FE 536
DESIGN OF EXPERIMENTS

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I. Prerequisites: A statistical course

II. Text Book: Montgomery, Douglas C., "Design and Analysis of Experiments", 2000, John Wiley and Sons, New York, 5th Ed or 6th Ed

III. Course Description

There are techniques to design an experiment and analyze the experimental data to reveal the effects of factors namely process variables. This course is about these methods and techniques, which provide a relationship between factors and response variables (outputs). It emphasizes the connection between the experiment and the model that the experimenter can develop from the results of the experiment. As an introduction to the course, the fundamental concepts of experimental design, such as randomization and blocking, comparison of treatments, the analysis of variance along with simple graphical techniques will be presented. Factorial and fractional factorial designs with particular emphasis on the two-level design system will be introduced. Fitting regression models (linear regression), Response surface methods (RSM), which are the tools for process optimization trough designed experiments, will be covered.
In many industries, the effective use of statistical experimental design is the key to higher yields, reduced variability, and better products. It is believed that, this course can be very useful for students from all science and engineering disciplines.

IV. Course Outline

I. Introduction
- I1. What is experimental design? The role of experimental design
- I2. Normality checking

II. Comparing treatments
- II1. Significance tests (Hypothesis) and confidence intervals for means and variances
- II2. Randomization and blocking with paired comparisons
- II3. Use of Analysis of Variance with a single factor
- II4. Randomization, blocking and Latin squares

III. Factorial design experiments
- III1. Introduction to factorial designs
- Iii2. Two level factorial designs
- Iii3. Fractional factorial designs and two-level fractional factorial designs
- Iii4. Three-level and mixed-level factorial designs

Iv. Response surface methods
- v1. Simple modeling with least squares (regression models)
- v2. Central composite design
- v3. Response surface methods and designs

V. Teaching Methods

Students will be assigned homework every two weeks. Computer software including statistical functions is required. Excel will be enough for the early homework assignments. There will be one midterm examination. Students are responsible for forming a study group of two people and finding a study topic for their term projects. Groups will also give a proposal seminar in the second half of the semester.

VI. Homework and Examinations

Midterm Exam: 40 % Presentation: 20% Term Project: 40%