MATH 699: Design and Analysis of Experiments
Spring 2024 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: Statistically designed experiments and their importance in data analysis, industrial experiments. Role of randomization. Fixed and random effect models and ANOVA, block design, Latin square design, factorial and fractional factorial designs and their analysis. Effective From: Spring 2006

Number of Credits: 3

Prerequisites: MATH 662

Course-Section and Instructors:

Course-Section	Instructor
Math 699-102	Professor S. Dhar

Office Hours for All Math Instructors: Spring 2024 Office Hours and Emails

Required Textbook:

Title	*Design and Analysis of Experiments*
Author	Montgomery
Edition	10th
Publisher	John Wiley & Sons
ISBN #	978-1119-49244-3

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 1, 2024**. It will be strictly enforced.

COURSE GOALS

Course Objectives

Statistically designed experiments and their importance in data analysis, industrial experiments. Role of randomization. Fixed and random effect models and ANOVA, block design, Latin square design, factorial and fractional factorial designs and their analysis.

Course Outcomes

- Read and recall Design of Experiment methods.
- Solve and analyze Design of Experiments statistical problems
- Collect ideas to do Design of Experiments statistical computations.
- Compare and contrast the best method (when to use the appropriate design) for setting up a design for an experiment, conduct (randomization) and analysis.

Course Assessment: Understand topics to be able to design, conduct, and analyze statistical data.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework and Quizzes	10%
Class Participation (see rubric) and worksheets	10%
Project	25%
Midterm Exam	25%
Final Exam	30%

Your final letter grade is on a tentative curve so that there are A's in the class.

Attendance Policy: Attendance at all classes will be recorded and is **mandatory and will affect one's grade as class participation is 10% of the grade**. Please make sure you read and fully understand the Math Department's Attendance Policy.

Canvas: Download Canvas app on your phone it will help.

Homework: Assignment (one will be created for this purpose by the instructor) in Canvas describes the HW assignments due weekly.

Graded work: Please present complaints regarding grading immediately after receiving the graded test, worksheet, or exam in-class.

Wandering: Do not wander in and out of the classroom.

Exams: There will be one midterm exam during the semester and a comprehensive final exam. Exam schedule:

Midterm Exam	Wednesday, March 29, 2023
Final Exam Period	May 3 - May 9, 2024

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Calculators: Calculators are allowed but should be basic, without graphing capabilities, algebraic simplification capabilities, formula-storing capabilities and without other such capabilities.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/accessibility/

Important Dates (See: Spring 2024 Academic Calendar, Registrar)

Date	Day	Event
January 16, 2024	Tuesday	First Day of Classes
January 22, 2024	Monday	Last Day to Add/Drop Classes
March 10, 2024	Sunday	Spring Recess Begins
March 16, 2024	Saturday	Spring Recess Ends
March 29, 2024	Friday	Good Friday - No Classes

April 1, 2024	Monday	Last Day to Withdraw
April 30, 2024	Tuesday	Friday Classes Meet
April 30, 2024	Tuesday	Last Day of Classes
May 1, 2024	Wednesday	Reading Day 1
May 2, 2024	Thursday	Reading Day 2
May 3 - May 9, 2024	Friday to Thursday	Final Exam Period

Course Outline

Lecture #	Day	Subject Topic
1	1/17	Introduction and Review
2	1/24	Simple Comparative Experiments
3	1/31	Experiments with a Single Factor: ANOVA - Part I
4	2/7	Experiments with a Single Factor: ANOVA - Part II
5	2/14	Randomized Block Designs
6	2/21	Latin Square Design, Greco-Latin Square
7	2/28	Balanced Incomplete Block Designs
8	3/6	Factorial Designs & Projects Due
9	3/13	No Class (Spring Break)
10	3/20	Two-power-k Factorial Designs & Projects Due
11	3/27	**MIDTERM EXAM**
12	4/3	Blocking and Confounding in Two-power-k Factorial Designs & Projects Due
13	4/10	Two-Level Fractional Factorial Designs & Projects Due
14	4/17	Presentations. (Time permits: Additional Design and Analysis Topics for Factorial & Fractional Factorial Designs & Selected Advanced Topics)
15	4/24	Course Review
		FINAL EXAM May 10, 2023, 6:00 pm to 8:30 pm

Grade Criteria for Class Participation (out of a maximum of 4)

Instructor uniquely identifies class names. Then, from there onwards following gives the criteria of a participation score from zero to four, at the end of the each class:

0: Student is absent (please give proof of extenuating circumstance to receive a grade of ‘E’, which will make sure your grades are not affected). Student has sustained attention on laptop/electronic devices. Not participating in the class at all. She/he is disruptive and says little or nothing in class. Contributions in class reflect inadequate preparation. Ideas offered are seldom substantive, provides few if any insights, and never a constructive direction for the class. Integrative comments are absent. Absence of this student saves valuable class-time.

1: Student is present and not disruptive. Does not offer much but tries to respond when called on. Student demonstrates very infrequent involvement in class discussion. This person says little or nothing in class. Hence, there is not an adequate basis for evaluation. Absence of this student would not change the quality of class discussion.

2: Student demonstrates adequate preparation: knows basic facts, but does not show evidence of trying to interpret or analyze them. She/he offers straightforward information (e.g., straight from the textbook), without elaboration or very infrequently (perhaps once a class). Does not offer to contribute to discussion, but contributes to a moderate degree when called on. Student demonstrates sporadic involvement. Contributions in class reflect satisfactory preparation. Ideas offered are sometimes substantive, provides generally useful insights but seldom offer a new direction for the discussion. If this person were not a member of the class, the quality of discussion would be diminished somewhat.

3: Student demonstrates good preparation: knows covered course material well, has thought through implications of them. She/he offers interpretations and analysis of course material (more than just facts) to class. Student contributes well to discussion in an ongoing way: responds to other students' points, thinks through their own points, questions others in a constructive way, offers and supports suggestions that may be counter to the majority opinion. Student demonstrates consistent ongoing involvement. Contributions in class reflect thorough preparation. Ideas offered by the student are usually substantive; provide good insights, and sometimes direction for the class. Absence of this student would diminish the quality of class discussion.

4: Student demonstrates excellent preparation: has analyzed covered course material exceptionally well, relating it to readings and other material (e.g., readings, course material, etc.). She/he offers analysis, synthesis, and evaluation of covered course material, e.g., puts together pieces of the discussion to develop new approaches that take the class further. Student contributes in a very significant way to ongoing discussion: keeps analysis focused, responds very thoughtfully to other students' comments, contributes to the cooperative argument building, suggests alternative ways of approaching material and helps class analyze which approaches are appropriate, etc. She/he demonstrates ongoing very active involvement. Contributions in class reflect exceptional preparation. Ideas offered are always substantive, and provide one or more major insights as well as direction for the class. Absence of this student would diminish the quality of class discussion markedly.

Calculate the class participation score by averaging scores each out of the maximum of four.

Updated by Professor S. Dhar - 12/8/2023
Department of Mathematical Sciences Course Syllabus, Spring 2024