MATH 699-102: Design and Analysis of Experiments
Spring 2020 Graduate 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 2020 Office Hours and Emails

Required Textbooks:

Title	*Design and Analysis of Experiments*
Author	Montgomery
Edition	9th
Publisher	John Wiley & Sons
ISBN #	978-1119113478

ExtraInfo

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 6, 2020**. It will be strictly enforced.

COURSE GOALS

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 Design of Experiment methods.
- Do Design of Experiments statistical problem solving and analysis.
- Gain ideas to do Design of Experiments statistical computations.
- Be conscientious of arriving at the best method (when to use the appropriate design) for setting up a Design for an Experimental, conduct (randomization) and analysis.

Course Assessment: Understanding of the topics at the level at which one is able to design, conduct, and analyze statistical data is assessed.

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)	10%
Project	25%
Midterm Exam	25%
Final Exam	30%

Your final letter grade will be based on the following tentative curve. Any complaints regarding grading have to be presented immediately after receiving the graded test or exam in-class.

A	90 - 100	C+	75 - 79
B+	85 - 89	C	65 - 74
B	80 - 84	F	0 - 64

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy. This policy will be strictly enforced.

Calculator: Bring a scientific basic calculator to all the lectures and exams. However, you are not allowed to bring calculators that have graphic display/ storage capacity (only simple calculators are allowed) in exams and quizzes.

Laptops: Computers and other communication devices should remain closed during lecture time, exams and quizzes. Unless, accessing textbook/notes online.

Looking into your neighbors work: During exams and keeping eyes hidden using hats, caps, etc., from the proctor but not from the neighbors work during exams is not allowed.

Wandering in and out of the classroom is not allowed.

Exams: There will be one midterm exam held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	April 1, 2020

Final Exam Period	May 8 - 14, 2020

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: To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- http://math.njit.edu/students/policies_exam.php

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

ADDITIONAL RESOURCES

Accommodation of Disabilities: Disability Support Services (DSS) 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 contact Chantonette Lyles, Associate Director of Disability Support Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Disability Support 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 Disability Support Services (DSS) website at:

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

Important Dates (See: Spring 2020 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2020	T	First Day of Classes
January 31, 2020	F	Last Day to Add/Drop Classes
March 15 - 22, 2020	Su-Su	Spring Recess: No Classes/ University Open
April 6, 2020	M	Last Day to Withdraw
April 10, 2020	F	Good Friday - University Closed
May 5, 2020	T	Friday Classes Meet - Last Day of Classes
May 6 & 7, 2020	W & R	Reading Days
May 8 - 14, 2020	F - R	Final Exam Period

Course Outline

Lecture	Section	Topic
1	1/22	Introduction and Review
2	1/29	Simple Comparative Experiments
3	2/5	Experiments with a Single Factor: ANOVA - Part I
4	2/12	Experiments with a Single Factor: ANOVA - Part II
5	2/19	Randomized Block Designs

6	2/26	Latin Square Design, Greco-Latin Square
7	3/4	Balanced Incomplete Block Designs
8	3/11	Factorial Designs & Projects Due
9	3/18	No Class (Spring Break)
10	3/25	Two-power-k Factorial Designs & Projects Due
11	4/1	**MIDTERM EXAM**
12	4/8	Blocking and Confounding in Two-power-k Factorial Designs & Projects Due
13	4/15	Two-Level Fractional Factorial Designs & Projects Due
14	4/22	Projects Due (Time permits: Additional Design and Analysis Topics for Factorial & Fractional Factorial Designs & Selected Advanced Topics)
15	4/29	Course Review
		FINAL EXAM

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

Once the student names are uniquely identified, from there onwards each student will receive a score of 0 to 4 at the end of the each class according to the following criteria:

0: Student is absent (please give proof of extenuating circumstance). 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. If this person were not a member of the class, valuable class-time would be saved.

1: Student is present and not disruptive. Tries to respond when called on but does not offer much. 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. If this person were not a member of the class, the quality of discussion would not be changed.

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. If this person were not a member of the class, the quality of discussion would be diminished.

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. If this person were not a member of the class, the quality of discussion would be diminished markedly.

The average score out of the maximum of 4 is used to calculate the class participation score.