MATH 341: Statistical Methods I
Spring 2025 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: Covers applications of classical statistical inference. Topics include transformation of variables, moment generating technique for distribution of variables, introduction to sampling distributions, point and interval estimation, maximum likelihood estimators and MVUES, basic statistical hypotheses and tests of parametric hypotheses about means of normal populations, chi-square tests of homogeneity, independence, goodness-of-fit. Effective From: Spring 2009.

Number of Credits: 3

Prerequisites: Math 244 with a grade of C or better or Math 333 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 341-002	Professor K. Carfora

Office Hours for All Math Instructors: Spring 2025 Office Hours and Emails

Required Textbook:

Title	*Mathematical Statistics with Applications*
Author	Wackerly, Mendenhall, and Scheaffer
Edition	7th
Publisher	Thomson Brooks/Cole
ISBN #	978-0495110811

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 7, 2025**. It will be strictly

enforced.

COURSE GOALS

Course Objectives

Covers applications of classical statistical inference. Topics include transformation of variables, moment generating technique for distribution of variables, introduction to sampling distributions, point and interval estimation, maximum likelihood estimators, basic statistical hypotheses and tests, classical tests of parametric hypotheses about means of normal populations, chi-square tests of homogeneity, independence, goodness- of-fit.

Course Outcomes

- Develop skills in the methods of mathematical statistics.
- Recall and apply different estimation techniques (method of moments, maximum likelihood).
- Develop the skills to compute uniformly minimum variance unbiased estimators.
- Recall and apply the likelihood ratio test.
- Recall and apply confidence intervals.
- Recall and apply hypothesis tests including Chi-squared tests of homogeneity of populations, independence of categorical variables and goodness-of-fit.
- Recall and compute the power of tests

Course Assessment: Will be based on regular homework, quizzes, a midterm exam, and a final exam.

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:

Attendance	5%
Homework	10%
Quizzes	20%
Midterm Exam	30%
Final Exam	35%

Your final letter grade will be based on the following curve.

A	90 - 100	**C**	70 – 74
B+	85 - 89	**D**	60 – 69

B	80 - 84	**F**	0 – 59
C+	75 – 79		

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.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Homework and Worksheet Policy: Homework problems assigned are listed at the end of each Chapter lecture. Assignments are on canvas and homework will be submitted via a **single PDF upload** to the appropriate canvas assignment.

Calculator: You need a scientific calculator for this course. **Graphing calculators are not allowed.**

Exams: There is **one midterm exam** held in class during the semester and one final exam.

Tentative Midterm Exam Date	Tuesday March 4, 2025
Final Exam Period	May 10 - May 16, 2025

Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: 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 Instructor that the exam will be missed. If possible, a makeup midterm exam will be given. If not possible, the student will take a cumulative final exam that will count as both the midterm and final exam grade.

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

AI Policy: This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Spring 2025 Hours)

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 2025 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2025	Tuesday	First Day of Classes
January 27, 2025	Monday	Last Day to Add/Drop Classes
March 16, 2025	Sunday	Spring Recess Begins
March 22, 2025	Saturday	Spring Recess Ends
April 3, 2025	Thursday	Wellness day
April 7, 2025	Monday	Last Day to Withdraw
April 18, 2025	Friday	Good Friday - No Classes
April 20, 2025	Sunday	Easter Sunday - No Classes Scheduled
May 6, 2025	Tuesday	Thursday Classes Meet
May 7, 2025	Wednesday	Friday Classes Meet
May 7, 2025	Wednesday	Last Day of Classes
May 8, 2025	Thursday	Reading Day 1
May 9, 2025	Friday	Reading Day 2
May 10 - May 16, 2025	Friday to Thursday	Final Exam Period

Course Outline (tentative)

Lecture	Chapter/ Sections	Topic
1, T 1/21	Introduction Review 3.9	Quick introduction to the course What you're expected to know from MATH 244/333 Moment Generating Functions of Discrete Variables
2, R 1/23	3.9 4.9 5.2	Moment Generating Functions of Discrete Variables Moment Generating Functions of Continuous Variables Bivariate Probability Distributions
3, T 1/28	5.2	Bivariate Probability Distributions
4, R 1/30	5.2 5.3	Bivariate Probability Distributions Marginal and Conditional Probability Distributions
5, T 2/4	5.3 5.4	Marginal and Conditional Probability Distributions Independent Random Variables
6, R 2/6	5.5 5.6 5.7 5.8	Expected Value of a Function of Random Variables Special Theorems for Expected Value Covariance of Two Random Variables Expected Value, Variance of Linear Functions of Variables
7, T 2/11	6.3	Method of Distribution Functions
8, R 2/13	6.3 6.4	Method of Distribution Functions Method of Transformations
9, T 1/18	6.5 6.7	Method of Moment-Generating Functions Order Statistics
10, R 1/20	7.2	Sampling Distributions: Normal Distributions
11, T 2/25	7.2	Sampling Distributions: Chi Square Distributions
12, R 2/27	7.2 7.3 Review	Sampling Distributions: Student t-distribution and Others The Central Limit Theorem Short Review of Topics for Midterm Exam
13, T 3/4		**Midterm Exam (Chapters 3-6) (Date Tentative)**
14, R 3/6	8.2 8.6	Bias and Mean Square Error of Point Estimates Large-Sample Confidence Intervals

15, T 3/11	8.6	Large-Sample Confidence Intervals
16, R 3/13	8.7 8.8	Selecting the Sample Size for Confidence Intervals Small-Sample Confidence Intervals for Population Means
Spring Recess ~ No Classes ~ University Open		
17, T 3/25	8.9 9.6	Confidence Intervals for Population Variance Method of Moments
18, R 3/27	9.7	Method of Maximum Likelihood Rao-Cramer Inequality (not in text)
19, T 4/1	9.5	Minimum-Variance Unbiased Estimation (MVUE)
No Classes R 4/3, Wellness Day		
20, T 4/8	10.2 10.3	Elements of a Statistical (Hypothesis) Test Common Large-Sample Tests
21, R 4/10	10.3 10.6	Common Large-Sample Tests Attained Significance Levels (P-Values)
22, T 4/15	10.8 10.9	Small-Sample Hypothesis Testing Testing Hypotheses Concerning Variances
23, R 4/17	10.4	Calculating Type II Error and Finding Sample Size
24, T 4/22 **Thur Schedule**	10.4 10.10	Calculating Type II Error and Finding Sample Size Power of Tests and the Neyman-Pearson Lemma
25, R 4/24	10.10	Power of Tests and the Neyman-Pearson Lemma
26, T 4/29	14.1-14.2 14.3	Analysis of Categorical Data; The Chi-Square Statistic Goodness of Fit Test
27, R 5/1	14.4 Review	Contingency Tables and the Test of Independence Short Review of Topics for Final Exam
28, T 5/6	Day of fun! (Time Permitting)	Group Work (Quiz Grade) - Challenge Problems

5-10 to 5-16	**Final Exam (Chapters 7-10, 14 and TBD selected other topics)**