

Fall 2023

MATH 341-001, Fall 2023: Statistical Methods I

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MATH 341: Statistical Methods I

Fall 2023 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, 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 341-001 | Professor S. Subramanian |

Office Hours for All Math Instructors: [Fall 2023 Office Hours and Emails](#)

Required Textbook:

| | |
|------------------|--|
| Title | <i>Mathematical Statistics with Applications</i> |
| 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, November 13, 2023**. 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

- Learn estimation techniques such as maximum likelihood.
- Develop the skills to compute uniformly minimum variance unbiased estimators.
- Learn the likelihood ratio test.
- Learn to compute confidence intervals.
- Learn to perform hypothesis tests.
- Learn to compute the power of tests

Course Assessment: Will be based on regular homework, two midterm exams, and one 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:

| | |
|------------------|-----|
| Homework/Quizzes | 20% |
| Midterm Exam I | 25% |
| Midterm Exam II | 25% |
| Final Exam | 30% |

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 and absence will affect the grade due to class participation requirement (10% of the grade).

Homework and Quiz Policy: Regular homework will be assigned. They need to be submitted on the due date in class. Late homework and emailed homework will not be accepted. If you miss class on the day of homework submission, you may hand it over to me perhaps on the previous lecture day that you attended.

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

| | |
|-----------------|------------------|
| Midterm Exam I | October 12, 2023 |
| Midterm Exam II | November 9, 2023 |

| | |
|-------------------|---------------------------------|
| Final Exam Period | December 17 - December 23, 2023 |
|-------------------|---------------------------------|

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.

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

Laptops: To the extent that they are needed to view the textbook online, they may be used; otherwise should be kept closed.

Grading: Grading complaints should be resolved immediately with the instructor.

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

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: **Fall 2023 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 need an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at oars@njit.edu, or visit Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is 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: **Fall 2023 Academic Calendar, Registrar**)

| Date | Day | Event |
|--------------------|---------|------------------------------|
| September 4, 2023 | Monday | Labor Day |
| September 5, 2023 | Tuesday | First Day of Classes |
| September 11, 2023 | Monday | Last Day to Add/Drop Classes |

| | | |
|-------------------------------------|--------------------------|------------------------------|
| November 13, 2023 | Monday | Last Day to Withdraw |
| November 21, 2023 | Tuesday | Thursday Classes Meet |
| November 22, 2023 | Wednesday | Friday Classes Meet |
| November 23 to November 26, 2023 | Thursday and Saturday | Thanksgiving Recess - Closed |
| December 13, 2023 | Wednesday | Last Day of Classes |
| December 14, 2023 | Thursday | Reading Day 1 |
| December 15, 2023 | Friday | Reading Day 2 |
| December 17 to December 23, 2023 | Sunday to Saturday | Final Exam Period |

Course Outline

| Week | Lecture | Section | Topic |
|---------------------|---------|---------|---|
| Week 1 9/5 (T) | 1 | 7.1-7.3 | Random Samples, Sampling Distributions related to the Normal Distribution |
| | 2 | 7.1-7.3 | Sampling Distributions related to the Normal Distribution |
| Week 2 9/12 (T) | 3 | 7.5 | Normal approximation to the binomial distribution |
| | 4 | 8.1-8.3 | Point estimators and their Bias and Mean Square Error |
| Week 3 9/19 (T) | 5 | 8.3-8.4 | Evaluating the goodness of a point estimator |
| | 6 | 8.5-8.6 | Large sample confidence intervals |
| Week 4 9/26(T) | 7 | 8.7-8.8 | Small sample confidence intervals |
| | 8 | 8.9 | Confidence intervals for the population variance |
| Week 5 10/3 (T) | 9 | 6.3-6.5 | Transformations |
| | 10 | 6.7 | Order Statistics |
| Week 6 10/10 (T) | 11 | | REVIEW FOR EXAM #1 |
| | | | MIDTERM EXAM I: THURSDAY ~ October 12, 2023 |
| Week 7 10/17 (T) | 12 | 9.2-9.3 | Relative Efficiency, Consistency |
| | 13 | 9.4 | Sufficiency |
| Week 8 10/24 (T) | 14 | 9.5-9.6 | Minimum variance unbiased estimation (MVUE) |
| | 15 | 9.6 | MVUEs |
| Week 9 10/31 (T) | 16 | 9.7 | Maximum likelihood estimation (MLE) |
| | 17 | 9.7 | MLEs |

| | | | |
|----------------------|-----------|----------------------|---|
| Week 10 11/7 (T) | | | MIDTERM EXAM II: THURSDay ~ November 9, 2023 |
| | 18 | | |
| | | | (WITHDRAWAL DEADLINE: Monday, November 13, 2023) |
| Week 11 11/14 (T) | 19 | 10.2 | Elements of a statistical test |
| | 20 | 10.3 | Common large sample tests |
| Week 12 11/21 (T) | 21 | 10.4 | Type II error and sample size determination |
| | 22 | 10.5 | Hypothesis testing vs Confidence intervals |
| 11/23 to 11/26 | | | Thanksgiving Recess |
| Week 13 11/28 (T) | 23 | 10.6 | Attained significance levels |
| | 24 | 10.8 | Small-sample hypothesis testing |
| Week 14 12/5 (T) | 25 | 10.10 - 10.11 | Neyman-Pearson lemma |
| | 26 | | Likelihood ratio tests |
| Week 15 12/12 (T) | | | December 12 (Tuesday): Final lecture |
| | | | Reading Day 12/14 and 12/15 (R & F) |
| 12/17-12/23 | | | Final EXAM WEEK |

*Updated by Professor S. Subramanian - 8/11/2023
Department of Mathematical Sciences Course Syllabus, Fall 2023*