

Fall 2023

MATH 279-101, Fall 2023: Statistics and Probability for Engineers

Adrian Ionescu

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MATH 279: Statistics and Probability for Engineers

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: This course introduces methods of summarizing and analyzing engineering data and the importance of observing processes over time such as control charts. Descriptive statistics, plots and diagrams are then used to summarize the data. Elements of probability and random variables with their distributions along with mean and variance are taught. All this knowledge is then used as a platform towards covering how to do basic estimation and inference, including confidence intervals and hypothesis testing based on a single sample. Students taking this course cannot receive degree credit for **MATH 225**, **MATH 244**, or **MATH 333**.

Number of Credits: 2

Prerequisites: **MATH 112** with a grade of C or better or **MATH 133** with a grade of C or better.

Course-Section and Instructors:

| Course-Section | Instructor |
|----------------|----------------------|
| Math 279-101 | Professor A. Ionescu |

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

Required Textbook:

| | |
|-----------|----------------------------------|
| Title | <i>Engineering Statistics</i> |
| Author | Montgomery, et al. |
| Edition | 5th |
| Publisher | John Wiley & Sons, Inc. |
| ISBN # | 978-0321912787 978-0470631478 |

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, November 13, 2023**. It will

be strictly enforced.

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 | 5% |
| Quizzes | 30% |
| Midterm Exam | 30% |
| Final Exam | 35% |

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

| | | | |
|----|----------|---|---------|
| A | 90 - 100 | C | 65 - 74 |
| B+ | 85 - 89 | D | 55 - 64 |
| B | 80 - 84 | F | 0 - 54 |
| 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](#). This policy will be strictly enforced.

Homework: Each week, either homework will be collected or a short quiz based on the homework will be given. There are no make-up quizzes, but the lowest quiz/HW grade for the semester will be dropped. If absent, homework will be accepted the following class for full credit. Otherwise, any late homework can be accepted at half credit.

Exams: There will be one midterm exam held in class during the semester and one comprehensive final exam. The final exam will be held during the following week:

| | |
|-------------------|---------------------------------|
| Midterm Exam | Week 8 |
| 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 other electronic devices must be switched off during all class times.

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 | Section | Topic | Homework Problems |
|------|-----------------------|---|---|
| 1 | 2.1-2.2, 2.4 | Data summary, Stem-and-Leaf Diagram, Box Plots | 2.1, 2.3, 2.4 (no dot plots), 2.15, 2.16, 2.34, 2.36, 2.38c, 2.40d |
| 2 | 3.3 | Probability Overview | 3.12, 3.15, 3.16, 3.17, 3.18 + additional problems assigned in class |
| 3 | 3.1-3.2, 3.7 | Random Variables; Discrete Random Variables | 3.91, 3.94, 3.95, 3.96, 3.99 |
| 4 | 3.8 | Discrete Uniform Distribution, Binomial Distribution | 3.107, 3.110, 3.111, 3.118 + Suppose a R.V. has a discrete distribution over the values 6, 7, 8, 9, 10. Find the expected value of X and standard deviation of X. |
| 5 | 3.4 | Probability Density Function, Mean and Variance | 3.21abc, 3.24, 3.27, 3.29, 3.34 |
| 6 | 3.9.1 | Poisson Distribution & Continuous Uniform Distribution | 3.122, 3.123, 3.124 + Suppose a R.V. X has a continuous uniform distribution on $0 < x < 5$. Find the mean and variance of X. Also find $P(4 < x < 7)$. |
| 7 | 3.9.2 | Exponential Distribution & REVIEW | 3.136, 1.137, 3.141 |
| 8 | | MIDTERM EXAM | |
| 9 | 3.5.1 | Normal Distribution | 3.43, 3.45, 3.47, 3.50, 3.54 |
| 10 | 3.13 | Point Estimates, Distribution of Sample Mean; Central Limit Theorem | 3.195, 3.199, 3.200, 3.203, 3.204 |
| 11 | 4.1-4.2, 4.4.5, 4.5.3 | Confidence Intervals, Choice of Sample Size | 4.36, 4.39d, 4.42d, 4.53c, 4.54c, and 4.60d |
| 12 | 4.3, 4.4 | Intro to Hypothesis Testing on the Mean | 4.37a, 4.38a (use rejection regions), 4.40a (use rejection regions), 4.42a |
| 13 | 4.3, 4.4 | P-values; T-test | 4.37bc, 4.39a, 4.40a, 4.41a, 4.42b, 4.43a |
| 14 | 4.5, 4.7 | Type I and Type II error, Tests on a Population Proportion and T-test | 4.39c, 4.41b, 4.42b 4.75abd, 4.82, 4.83ab, 4.87a |
| | L► | REVIEW FOR FINAL EXAM | |

*Updated by Professor A. Ionescu - 8/9/2023
Department of Mathematical Sciences Course Syllabus, Fall 2023*