Fall 2024

# MATH 661-105: Applied Statistics

T. Falconer

# MATH 661: Applied Statistics
## *Fall 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: Role and purpose of statistical methods in understanding information. Data visualization and use of statistical software used in course. Descriptive statistics, summary measures for quantitative and categorical data, elementary probability and common probability distribution models. Computational statistical inference: confidence intervals and tests for means, variances, and proportions. Linear regression analysis and inference. Introduction to design of experiments and ANOVA, ANCOVA and their analysis. MATH 661 and MATH 663 cannot both be used toward degree credits at NJIT.**

**Number of Credits:** 3

**Prerequisites:** MATH 112

**Course-Section and Instructors:**

| Course-Section | Instructor |
|---|---|
| Math 661-105 | Professor T. Falconer |

**Office Hours for All Math Instructors:** Fall 2024 Office Hours and Emails

**Required Textbook:**

| | |
|---|---|
| **Title** | *Introduction to the Practice of Statistics* |
| **Author** | Moore, McCabe, and Craig |
| **Edition** | 10th |
| **Publisher** | MacMillan Learning |
| **ISBN #** | 1. E-book ISBN: 978-1319377656<br>2. Loose-Leaf ISBN: 978-1319383985<br>3. Paperback ISBN: 978-1319244446 |

**University-wide Withdrawal Date**: The last day to withdraw with a **W** is **Monday, November 11, 2024**. It will be strictly enforced.

## COURSE GOALS

**Course Objectives:**

- This course will acquaint students with fundamental statistical techniques and statistical reasoning that can be applied to many real world contexts.

**Course Outcomes**

On successful completion of this course, the student will be able to:

- Explain and apply statistical methods for displaying, summarizing and describing data
- Explain and perform basic probability calculations
- Define and explain sampling distributions and the central limit theorem
- Perform statistical analysis including estimation, hypothesis testing, and analysis of variance
- Understanding how to interpret estimates of common regression methods
- Exposed to scientific literature to understand how statistics is used in research

## 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:

| | |
|---|---|
| **Homeworks** | 20% |
| **Class attendance and participation (including journal club)** | 20% |
| **Mid-term Exam** | 30% |
| **Final Exam** | 30% |

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

| | | | |
|---|---|---|---|
| **A** | 90 - 100 | **C+** | 60 - 69 |
| **B+** | 80 - 89 | **C** | 50 - 59 |
| **B** | 70 - 79 | **F** | 0 - 49 |

**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.

**Exams**: There will be one exam during the semester and a cumulative final exam:

| | |
|---|---|
| Midterm Exam | TBD |
| Final Exam | According to registrar |

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.

## 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 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 2024 Academic Calendar, Registrar)

| Date | Day | Event |
|---|---|---|
| September 2, 2024 | Monday | Labor Day |
| September 3, 2024 | Tuesday | First Day of Classes |
| September 9, 2024 | Monday | Last Day to Add/Drop Classes |
| November 11, 2024 | Monday | Last Day to Withdraw |
| November 26, 2024 | Tuesday | Thursday Classes Meet |
| November 27, 2024 | Wednesday | Friday Classes Meet |
| November 28 to December 1, 2024 | Thursday and Sunday | Thanksgiving Recess - Closed |
| December 11, 2024 | Wednesday | Last Day of Classes |
| December 12, 2024 | Thursday | Reading Day 1 |

| | | |
|---|---|---|
| December 13, 2024 | Friday | Reading Day 2 |
| December 15 to December 21, 2024 | Sunday to Saturday | Final Exam Period |

# Course Outline

| Week | Subject Topic |
|---|---|
| Week 1 | *Class introductions; R set-up; introduction to basic probability theory* |
| Week 2 | *Continuation of probability theory: sets and counting methods (chapter 1)* |
| Week 3 | *Introduction to statistics: history of statistics; introduction to count data and sample distributions (chapter 2)* |
| Week 4 | *Statistics: data distributions and common probability density functions (section 1.4)* |
| Week 5 | *Statistics: correlations and introduction to hypothesis testing (section 2.3, chapter 4, chapter 6)* |
| Week 6 | *Continuation of statistical testing of hypotheses (chapter 7, chapter 8)* |
| Week 7 | *Continuation of statistical testing of hypotheses (chapter 9, chapter 12, 13)* |
| Week 8 | *Mid-term examination (conducted during class time)* |
| Week 9 | *Continuation of statistical testing of hypotheses, ANOVA* |
| Week 10 | *ANCOVA, Univariate linear regression: fundamentals of regression (chapter 10)* |
| Week 11 | *Univariate linear regression (chapter 10)* |
| Week 12 | *Multivariable linear regression (chapter 11)* |
| Week 13 | *Multivariable linear regression (chapter 11)* |
| Week 14 | *Logistic regression (chapter 14)* |
| Final Exam | *Final exam schedule to be set by Registrar* |