MATH 665-102: Statistical Inference
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: Review of sampling distributions. Data reduction principles: sufficiency and likelihood. Theory and methods of point estimation and hypothesis testing, interval estimation, nonparametric tests, introduction to linear models.

Number of Credits: 3

Prerequisites: MATH 662 or departmental approval.

Course-Section and Instructors:

Course-Section	Instructor
Math 665-102	Professor S. Subramanian

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

Required Textbook:

Title	*Introduction to Mathematical Statistics*
Author	Hogg, McKean, and Craig
Edition	8th
Publisher	Pearson
ISBN #	ISBN-13: 9780134686998

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

This course will focus on mathematical methods for statistical inference. Topics include review of sampling distributions, data reduction principles: sufficiency and likelihood, theory and methods of point estimation and hypothesis testing, interval estimation, and bootstrap procedures.

Course Outcomes On successful completion, students will be able to demonstrate understanding of the following topics:

1. Consistency and asymptotic normality
2. Delta method
3. Maximum likelihood estimation
4. Sufficiency
5. Minimum variance unbiased estimation
6. Hypothesis tests; uniformly most powerful tests; likelihood ratio 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	20%
Midterm Exams (1 and 2)	25% each
Final Exam	30%

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

A	90 - 100	**C+**	75 - 79
B+	85 - 89	**C**	66 - 74
B	80 - 84	**F**	0 - 65

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: Homework assignments are due within a week unless announced otherwise by the instructor. Late homework will not be accepted.

Exams: Two in-class midterm examinations and one final examination will be given as shown below. The indicated midterm exam dates are tentative and may be subject to change.

Midterm Exam 1	February 25, 2025
Midterm Exam 2	April 15, 2025
Final Exam Period	May 10 - May 16, 2025

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.

AI usage policy: AI usage is not permitted in this course for solving problems in class/homework assignments, quizzes, and exams. Any violations will be dealt with according to the NJIT's academic integrity policy.

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

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 are in need of accommodations due to a disability please contact Scott Janz, Associate Director of Disability Support Services at 973-596-5417 or via email at scott.p.janz@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

Week	Section	Topic
Week 1 1/21	Chapter 4	**Some Elementary Statistical Inference** Sampling and statistics; confidence intervals; hypothesis testing.
Week 2 1/28	Chapter 6	**Maximum likelihood Methods** Rao-Cramer lower bound and efficiency; plug-in estimators; method of moments
Week 3 2/4	Chapter 6	**Maximum likelihood Methods** Maximum likelihood tests; multiparameter case: estimation and testing
Week 4 2/11	Chapter 7	**Sufficiency** Sufficient statistic and properties: Rao Blackwell; completeness and uniqueness
Week 5 2/18	Chapter 7	**Sufficiency (continued)** Minimum variance unbiased estimators; exponential family; functions of a parameter

Week 6 2/25	**MIDTERM EXAM I: TUESDAY ~ FEBRUARY 25, 2025**	
Week 7 3/4	**Chapter 7**	**Sufficiency (continued)** Minimal sufficiency; ancillary statistics. Sufficiency, completeness and independence
Week 8 3/11	**Chapter 8**	**Optimal Tests of Hypotheses** Most powerful tests; Neyman-Pearson lemma
Week of 3/16 -- 3/23		SPRING RECESS (NO CLASSES)
Week 9 3/25	**Chapter 8**	**Optimal Tests of Hypotheses (continued)** Uniformly most powerful tests; likelihood ratio tests
Week 10 4/1	**Chapter 8**	**Optimal Tests of Hypotheses (continued)** Monotone likelihood ratio
Week 11 4/8	**Chapter 8**	**Optimal Tests of Hypotheses (continued)** The sequential probability ratio test
Week 12 4/15	**MIDTERM EXAM II: TUESDAY ~ APRIL 15, 2025**	
Week 13 4/22	**Chapter 5**	**Consistency and limiting distributions** Consistency; central limit theorem; delta method; moment generating functions
Week 14 4/29	**Chapter 5**	**Consistency and limiting distributions** Consistency; central limit theorem; delta method; moment generating functions
WeeK 15 5/6	----------	**5/6 Tuesday: Thursday classes meet** **5/7 Wednesday: Friday classes meet**
		Reading Day 5/8 and 5/9 (R and F)
5/10 to 5/16		**Final Exam week**