

MATH 665: Statistical Inference *Spring 2022 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.

Please be sure you read and fully understand our [DMS Online Exam Policy](#).

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 2022 Office Hours and Emails](#)

Required Textbook:

Title	<i>Introduction to Mathematical Statistics</i>
Author	Hogg, McKean, Craig
Edition	8th
Publisher	Pearson
ISBN #	978-0134686998

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 4, 2022**. 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, bootstrap procedures and the EM algorithm.

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
7. Sequential probability ratio test

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	50%
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](#).

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 I	March 1, 2022
Midterm Exam II	April 12, 2022
Final Exam Period	May 6 - May 12, 2022

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

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/studentsuccess/accessibility/>

Important Dates (See: **Spring 2022 Academic Calendar, Registrar**)

Date	Day	Event
January 18, 2022	Tuesday	First Day of Classes
January 22, 2022	Saturday	Saturday Classes Begin
January 24, 2022	Monday	Last Day to Add/Drop Classes
March 14, 2022	Monday	Spring Recess Begins
March 19, 2022	Saturday	Spring Recess Ends

April 4, 2022	Monday	Last Day to Withdraw
April 15, 2022	Friday	Good Friday - No Classes
April 17, 2022	Sunday	Easter Sunday - No Classes
May 3, 2022	Tuesday	Friday Classes Meet
May 3, 2022	Tuesday	Last Day of Classes
May 4 - May 5, 2022	Wednesday and Thursday	Reading Days
May 6 - May 12, 2022	Friday to Thursday	Final Exam Period

Course Outline

Week	Section	Topic
Week 1 1/18	Chapter 5	Consistency and limiting distributions Consistency; central limit theorem; delta method; moment generating functions
Week 2 1/25	Chapter 4	Some Elementary Statistical Inference Sampling and statistics; confidence intervals; hypothesis testing.
Week 3 2/1	Chapter 6	Maximum likelihood Methods Rao-Cramer lower bound and efficiency; plug-in estimators; method of moments
Week 4 2/8	Chapter 6	Maximum likelihood Methods Maximum likelihood tests; multiparameter case: estimation and testing
Week 5 2/15	Chapter 7	Sufficiency Sufficient statistic and properties: Rao Blackwell; completeness and uniqueness
Week 6 2/22	Chapter 7	Sufficiency (continued) Minimum variance unbiased estimators; exponential family; functions of a parameter
Week 7 3/1	MIDTERM EXAM I: TUESDAY ~ MARCH 1, 2022	
Week 8 3/8	Chapter 7	Sufficiency (continued) Minimal sufficiency; ancillary statistics. Sufficiency, completeness and independence
Week of 3/15		SPRING RECESS (NO CLASSES)
Week 9 3/22	Chapter 8	Optimal Tests of Hypotheses

		Most powerful tests; Neyman-Pearson lemma
Week 10 3/29	Chapter 8	Optimal Tests of Hypotheses (continued) Uniformly most powerful tests; likelihood ratio tests
Week 11 4/5	Chapter 8	Optimal Tests of Hypotheses (continued) Monotone likelihood ratio
Week 12 4/12	MIDTERM EXAM II: TUESDAY ~ APRIL 12, 2022	
Week 13 4/19	Chapter 8	Optimal Tests of Hypotheses (continued) The sequential probability ratio test
Week 14 4/26	Chapter 4	Bootstrap procedures (if time permits)
Week 15 5/3	-----	Friday classes meet

*Updated by Professor S. Subramanian - 1/13/2022
Department of Mathematical Sciences Course Syllabus, Spring 2022*