

MATH 665: Statistical Inference

Spring 2019 Graduate 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 W. Guo

Office Hours for All Math Instructors: [Spring 2019 Office Hours and Emails](#)

Required Textbooks:

Title	<i>Introduction to Mathematical Statistics</i>
Author	Hogg, McKean, and Craig
Edition	7th
Publisher	Pearson
ISBN #	978-0321795434

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 8, 2019**. It will be strictly enforced.

COURSE GOALS

Course Objectives and Description: 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:

- Consistency and asymptotic normality
- Delta method
- Maximum likelihood estimation
- Sufficiency
- Minimum variance unbiased estimation
- Hypothesis tests; uniformly most powerful tests; likelihood ratio tests
- 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	25%
Midterm Exam	35%
Final Exam	40%

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

A	90 - 100	C+	70 - 74
B+	80 - 89	C	60 - 69
B	75 - 79	F	0 - 59

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

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

Midterm Exam	March 5, 2019
Final Exam Period	May 10 - 16, 2019

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: To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- http://math.njit.edu/students/policies_exam.php

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

ADDITIONAL RESOURCES

Accommodation of Disabilities: Disability Support Services (DSS) 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 Chantonette Lyles, Associate Director of Disability Support Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Fenster Hall, Room 260. A Letter of Accommodation Eligibility from the Disability Support 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 Disability Support Services (DSS) website at:

- <http://www5.njit.edu/studentsuccess/disability-support-services/>

Important Dates (See: [Spring 2019 Academic Calendar](#), Registrar)

Date	Day	Event
January 22, 2019	T	First Day of Classes
February 1, 2019	F	Last Day to Add/Drop Classes
March 17 - 24, 2019	Su - Su	Spring Recess - No Classes, NJIT Open
April 8, 2019	M	Last Day to Withdraw
April 19, 2019	F	Good Friday - No Classes, NJIT Closed
May 7, 2019	T	Friday Classes Meet/ Last Day of Classes
May 8 & 9, 2019	W & R	Reading Days
May 10 - 16, 2019	F - R	Final Exam Period

Course Outline

Date	Lecture	Sections	Topic	Assignment
WEEK 1 1/22	1	Chapter 5	CONSISTENCY AND LIMITING DISTRIBUTIONS Convergence; central limit theorem; delta method; moment generating functions	
WEEK 2 1/29	2	Chapter 4	SOME ELEMENTARY STATISTICAL INFERENCE Sampling and statistics; confidence intervals; hypothesis testing	Homework 1
WEEK 3 2/5	3	Chapter 6	MAXIMUM LIKELIHOOD METHODS Rao-Cramer lower bound and efficiency; plug-in estimators; method of moments	
WEEK 4 2/12	4	Chapter 6	MAXIMUM LIKELIHOOD METHODS (CONTINUED) Maximum likelihood tests; multiparameter case: estimation and testing	Homework 2
WEEK 5 2/19	5	Chapter 7	SUFFICIENCY Sufficient statistic and properties: Rao Blackwell; completeness and uniqueness	
WEEK 6 6	6	Chapter 7	SUFFICIENCY (CONTINUED) Minimum variance unbiased estimators; exponential family; functions of	Homework 3

2/26			a parameter	
WEEK 7 3/5			MIDTERM EXAM: TUESDAY ~ MARCH 5, 2019	
WEEK 8 3/12	7	Chapter 7	SUFFICIENCY (CONTINUED) Minimal sufficiency; ancillary statistics; sufficiency, completeness and independence	
WEEK 9 3/19			SPRING RECESS (NO CLASSES)	
WEEK 10 3/26	8	Chapter 8	OPTIMAL TESTS OF HYPOTHESES Most powerful tests; Neyman-Pearson lemma	Homework 4
WEEK 11 4/2	9	Chapter 8	OPTIMAL TESTS OF HYPOTHESES (CONTINUED) Uniformly most powerful tests; likelihood ratio tests; monotone likelihood ratio	
WEEK 12 4/9	10	Chapter 8	OPTIMAL TESTS OF HYPOTHESES (CONTINUED) The sequential probability ratio test	Homework 5
WEEK 13 4/16	11	Chapter 9	INFERENCE ABOUT NORMAL MODELS Quadratic forms; ANOVA	
WEEK 14 4/23	12	Chapter 9	INFERENCE ABOUT NORMAL MODELS (CONTINUED) Multiple comparisons; tests for independence; linear regression	Homework 6
WEEK 15 4/30	13		REVIEW FOR FINAL EXAM	
WEEK 16 5/7			NO CLASS ~ FOLLOW A FRIDAY SCHEDULE	
WEEK 17 5/14			FINAL EXAM: TUESDAY ~ MAY 14, 2019	

*Updated by Professor W. Guo - 1/21/2019
Department of Mathematical Sciences Course Syllabus, Spring 2019*
