NJIT New Jersey's Science & Technology University

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF MATHEMATICAL SCIENCES

# MATH 665: Statistical Inference
## *Spring 2021 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 with a grade of C or better.

**Course-Section and Instructors**

| Course-Section | Instructor |
|---|---|
| Math 665-102 | Professor A. Wang |

**Office Hours for All Math Instructors**: Spring 2021 Office Hours and Emails

**Required Textbooks**:

| | |
|---|---|
| **Title** | *Statistical Inference* |
| **Author** | Casella and Berger |
| **Edition** | 2nd |
| **Publisher** | Cengage |
| **ISBN #** | 978-0534243128 |

**University-wide Withdrawal Date**:The last day to withdraw with a **W** is **Monday, April 5, 2021**. It will be strictly enforced.

## COURSE GOALS/ EXTRA INFORMATION

**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: point estimation and hypothesis testing, interval estimation, nonparametric tests, introduction to linear models. Problem solving is emphasized. At least one birds-eye-view of the topic will be given. Methods material will be discussed, proofs given at the course level and few examples/problems of the topic covered will be demonstrated. Software will be used as a tool to motivate the subject matter.

**Course Outcomes:**

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

- Read mathematical statistics methods.
- Do mathematical statistics problem solving.
- Gain ideas to do statistical computations.
- Use a data reduction method.
- Perform estimation techniques to capture information and develop analysis of data.
- Be conscientious of choosing the best method for problem solving.
- Consistency and asymptotic normality
- Delta method
- Maximum likelihood estimation Sufficiency Minimum variance unbiased estimation
- Hypothesis tests; uniformly most powerful tests; likelihood ratio tests

**Course Assessment**: Understanding of the topics at the level at which one is able to apply the methods to do problem solving is assessed.

## 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 and Quizzes** | 30% |
| **Midterm Exam** | 30% |
| **Final Exam** | 40% |

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

| | | | |
|---|---|---|---|
| **A** | 90 - 100 | **C** | 68 - 74 |
| **B+** | 85 - 89 | **D** | 50 - 67 |
| **B** | 80 - 84 | **F** | 0 - 49 |
| **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 Policy**: Homework problems will be assigned in class.

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

| | |
|---|---|
| Midterm Exam | March 23, 2021 |
| Final Exam | May 7 - 13, 2021 |

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**: 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 Chantonette Lyles, Associate Director of Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services 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 2021 Academic Calendar, Registrar)

| Date | Day | Event |
|---|---|---|
| January 19, 2021 | T | First Day of Classes |
| January 23, 2021 | S | Saturday Classes Begin |
| January 25, 2021 | M | Last Day to Add/Drop Classes |
| March 14 - March 21, 2021 | Su - Su | Spring Recess - No Classes |
| April, 2, 2021 | F | Good Friday - No Classes |
| April 5, 2021 | M | Last Day to Witdraw |
| May 4, 2021 | T | Friday Classes Meet |
| May 4, 2021 | T | Last Day of Classes |
| May 5 & May 6, 2021 | W & R | Reading Days |
| May 7 - May 13, 2021 | F - R | Final Exam Period |

# Course Outline

| Date | Lecture | Chapter | Topic |
|---|---|---|---|
| **WEEK 1** 01/19 | 1 | Chapter 5 | Properties of a random sample |
| **WEEK 2** 01/26 | 2 | Chapter 5 | Properties of a random sample |
| **WEEK 3** 02/02 | 3 | Chapter 6 | Principles of Data Reduction |
| **WEEK 4** 02/09 | 4 | Chapter 6 | Principles of Data Reduction |

| | | | |
|---|---|---|---|
| **WEEK 5** 02/16 | 5 | Chapter 7 | Point estimation |
| **WEAK 6** 02/23 | 6 | Chapter 7 | Point estimation |
| **WEEK 7** 03/02 | 7 | Chapter 7 | Point estimation |
| **WEEK 8** 03/09 | 8 | Chapter 7 | Point Estimation & Midterm Review |
| **WEEK 10** 03/23 | 9 | Midterm Exam | |
| **WEEK 11** 03/30 | 10 | Chapter 8 | Hypothesis testing |
| **WEEK 12** 04/06 | 11 | Chapter 8 | Hypothesis testing |
| **WEEK 13** 04/13 | 12 | Chapte r9 | Interval estimation |
| **WEEK 14** 04/20 | 13 | Chapter 9 | Interval estimation |
| **WEEK 15** 04/27 | 14 | Chapter 10 | Asymptotic Evaluations |
| **WEEK 16** 05/04 | 15 | | Review for Final Exam |
| | | | **FINAL EXAM WEEK** (5/7 - 5/13) |

*Updated by Professor A. Wang- 1/9/2021*
*Department of Mathematical Sciences Course Syllabus, Spring 2021*