MATH 662: Probability Distributions
Fall 2021 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: Probability, conditional probability, random variables and distributions, independence, expectation, moment generating functions, useful parametric families of distributions, transformation of random variables, order statistics, sampling distributions under normality, the central limit theorem, convergence concepts and illustrative applications.

Number of Credits: 3

Prerequisites: MATH 341 or MATH 333, and departmental approval.

Course-Section and Instructors:

Course-Section	Instructor
Math 662-101	Professor S. Dhar

Office Hours for All Math Instructors: Fall 2021 Office Hours and Emails

Required Textbook:

Title	*Introduction to Mathematical Statistics*
Author	Hogg, McKean, and Craig
Edition	8th
Publisher	Pearson
ISBN #	978-0-13-468699-8

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Wednesday, November 10, 2021**. It will be strictly enforced.

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/ Quizzes	20%
Class Participation (please see rubric appended below)	10%
Midterm Exam	35%
Final Exam	35%

Grading Scale: Your final letter grade will be **based on a curve** that ensures at least a few A's. Please see Canvas for posted practice problems, HW/Quiz assignments on Math 662 topics. Homework is generally due within a week unless announced otherwise by the instructor. Solutions to the assignments will be handed out in class and discussed (please see the Math 662 Course in Canvas). **As soon as the class submits the assignments, the instructor's solutions keys are immediately handed out therefore late homework is not accepted**.

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: No late homework will be accepted. Time extensions to the assignment due if sought beforehand may be granted to the entire class at the instructor's discretion.

Discussing homework with classmates and the instructor is encouraged. However, all homework is to be written and completed individually (please do not copy off each other's HW/assignments because that is an example of plagiarism. Please refer to the university honor code (http://integrity.njit.edu/) if there are any ambiguities.

Please submit a hardcopy of your HW solution at the beginning of class at 6 pm. A graded HW file with grades out 10 points.

Quizzes: Initially, the participation score uses quizzes on the topics covered in class. There is no make-up for missed quizzes. Imputed score is used in case of extenuating circumstances (note there is a no makeup departmental policy followed in the 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 day(s):

Midterm Exam	October 20, 2021
Final Exam	December 15 - 21, 2021 (Math 662: Wed. Dec. 15, 6:00 pm-8:30 pm)

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.

Course Policies: It is required that the student read the textbook for the material already covered in class by the instructor and confirm that the basic solved problems are understood and practice solving diverse textbook problems with both examples and exercises. More explicitly, students must work on the examples and exercises and problems from the textbook on the topics already covered in class, and learn to solve them correctly. The student should compare his or her answers with those given at the end of the textbook or by the instructor. Instructor holds the right to modify in class exams, homework, quizzes dates in the best interest of the class. Official announcements are made using NJIT student emails or emails provided by students to NJIT as official emails.

- Any complaints regarding grading have to be presented immediately after receiving the graded quizzes / tests.
- Looking into your neighbor's work during exams is not allowed. Keeping eyes hidden using hats, caps, etc. during exams is not allowed.
- Instructors will maintain a detailed record of your attendance which is reported to the NJIT administration.
- The use of laptops, cell phones, beepers, or any sort of communication devices (text messaging, internet, notepad, etc.) during regular classes, exams and quizzes are not allowed. Please note that the laptop should remain shut down during lecture time in class.
- No eating allowed during the class and exams periods. You are expected to remain in the classroom for the entire class period. Not allowed to wander in and out of the classroom.
- **You must wear a mask all the time - it is mandatory.**

Office hours and classes are face-to-face.

All other information will be exchanged via Canvas email and other tools.

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Fall 2021 Hours)

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: Fall 2021 Academic Calendar, Registrar)

Date	Day	Event
September 1, 2021	Wednesday	First Day of Classes
September 4, 2021	Saturday	Saturday Classes Begin
September 6, 2021	Monday	Labor Day
September 8, 2021	Wednesday	Monday Classes Meet
September 8, 2021	Wednesday	Last Day to Add/Drop Classes
November 10, 2021	Wednesday	Last Day to Withdraw
November 25 to November 28, 2021	Thursday to Sunday	Thanksgiving Recess - Closed
December 10, 2021	Friday	Last Day of Classes
December 13 and December 14, 2021	Monday and Tuesday	Reading Days
December 15 to December 21, 2021	Wednesday to Tuesday	Final Exam Period

Course Outline

Lecture	Date	Topic
1	***9/1***	Chapter 1: ***Probability & Distributions*** The probability set function, conditional probability and independence, random variables, discrete and continuous random variables, probability mass functions (p. m. f.) and density functions (p. d. f.).
2	***9/15***	Chapter 1: ***Probability & Distributions*** Transformations, expected value of a random variable, some special expectations.
3	***9/22***	Chapter 1: ***Probability & Distributions*** Moment generating functions (m. g. f.), important inequalities. Functions of a single r. v. ***Multivariate Distributions*** Distribution of two random variables.
4	***9/29***	Chapter 2: ***Multivariate Distributions*** Transformations, conditional distributions and expectations.
5	***10/6***	Chapter 2: ***Multivariate Distributions*** Correlation coefficient, independent random variables, extension to several random variables.

6	***10/13***	Chapter 2: ***Multivariate Distributions***, Some Special Distributions, Random vector transformation, Linear Combinations of Random Variables, binomial and related distributions: geometric, negative binomial. Hypergeometric distribution, Poisson distribution.
7	***10/20***	**Midterm EXAM: October 20, 2021**
8	***10/27***	Chapter 3: ***Some Special Distributions*** Exponential, gamma, uniform distribution chi-squared, beta and normal distributions.
9	***11/3***	Chapter 3: ***Some Special Distributions***, ***Unbiasedness*** Multivariate Normal distribution. The t and F-distributions, distribution of sample mean and variance under normality, mixture distributions.
10	***11/10***	Chapter 4: ***Sampling and Statistics***, ***Order Statistics***
11	***11/17***	Chapter 5: ***Convergence in Probability***, ***Convergence in Distribution***
12	***11/24***	Chapter 5: ***MGF Technique***
13	***12/1***	Chapter 5 : ***Central Limit Theorem***
14	***12/8***	***REVIEW***

Grade Criteria for Class Participation (out of a maximum of 4)

Once the student names are uniquely identified, from there onwards each student will receive a score of 0 to 4 at the end of the each class according to the following criteria:

0: Student is absent (please give proof of extenuating circumstances). Students have sustained attention on laptop/electronic devices. Not participating in the class at all. She/he is disruptive and says little or nothing in class. Contributions in class reflect inadequate preparation. Ideas offered are seldom substantive, provide few if any insights, and never a constructive direction for the class. Integrative comments are absent. If this person were not a member of the class, valuable class-time would be saved.

1: Students are present and not disruptive. Tries to respond when called on but does not offer much. Students demonstrate very infrequent involvement in class discussion. This person says little or nothing in class. Hence, there is not an adequate basis for evaluation. If this person were not a member of the class, the quality of discussion would not be changed.

2: Student demonstrates adequate preparation: knows basic facts, but does not show evidence of trying to interpret or analyze them. She/he offers straightforward information (e.g., straight from the textbook), without elaboration or very infrequently (perhaps once a class). Does not offer to contribute to discussion, but contributes to a moderate degree when called on. Students demonstrate sporadic involvement. Contributions in class reflect satisfactory preparation. Ideas offered are sometimes substantive, provide generally useful insights but seldom offer a new direction for the discussion. If this person were not a member of the class, the quality of discussion would be diminished somewhat.

3: Student demonstrates good preparation: knows covered course material well, has thought through implications of them. She/he offers interpretations and analysis of course material (more than just facts) to class. Students contribute well to discussion in an ongoing way: responds to other students' points, thinks through their own points, questions others in a constructive way, offers and supports suggestions that may be counter to the majority opinion. Students demonstrate consistent ongoing involvement. Contributions in class reflect thorough preparation. Ideas offered by the student are usually substantive; provide good insights, and

sometimes direction for the class. If this person were not a member of the class, the quality of discussion would be diminished.

4: Student demonstrates excellent preparation: has analyzed covered course material exceptionally well, relating it to readings and other material (e.g., readings, course material, etc.). She/he offers analysis, synthesis, and evaluation of covered course material, e.g., puts together pieces of the discussion to develop new approaches that take the class further. Students contribute in a very significant way to ongoing discussion: keeps analysis focused, responds very thoughtfully to other students' comments, contributes to the cooperative argument-building, suggests alternative ways of approaching material and helps class analyze which approaches are appropriate, etc. She/he demonstrates ongoing very active involvement. Contributions in class reflect exceptional preparation. Ideas offered are always substantive, and provide one or more major insights as well as direction for the class. If this person were not a member of the class, the quality of discussion would be diminished markedly.

The average score out of the maximum of 4 is used to calculate the class participation score.

Updated by Professor S. Dhar - 8/13/2021
Department of Mathematical Sciences Course Syllabus, Fall 2021