NYU – Courant Institute of Mathematics
Mathematics at Tandon
Course Outline MA-UY 2224 Data Analysis
Fall 2020

Faculty

MA-UY 2224 A	Qian, Jinghua	10:00 A	11:50 P	MW	Jq303@nyu.edu
MA-UY 2224 B	Spizzirri, Nicholas	10:00 A	11:50 P	MW	Nes279@nyu.edu
MA-UY 2224 C	Qian, Jinghua	2:00 P	3:50 P	MW	Jq303@nyu.edu
MA-UY 2224 D	Medina, Luciano	2:00 P	3:50 P	MW	Lmedina@nyu.edu
MA-UY 2224 E	Constantine, Adam	6:00 P	7:50 P	MW	Ac5597@nyu.edu
MA-UY 2224 F	Stepp, Elizabeth	6:00 P	7:50 P	MW	Es171@nyu.edu

Course Prerequisites
MA 1124 or MA1424 or MA 1132 or equivalent.

Course Description
This is an introductory course to probability and statistics. It affords the student some acquaintance with both probability and statistics in a single term. Topics in Probability include combinatorics; mathematical treatment of chance; Binomial, Poisson, Uniform, Exponential, Normal and other distributions; expectation of random variables; the Central Limit Theorem and the normal approximation. Topics in Statistics include study of basic data description and summaries, sampling distribution of sample mean and sample variance; normal, t-, and Chi-square distributions; confidence intervals; testing of hypotheses; least square regression model. Applications to Computer Engineering, Financial Engineering, and other engineering subjects are integrated into the course.

Course Structure:
The 4-credit one semester course meets for lecture twice a week for 110 minutes each class. You are also expected to study outside of class, three hours of study is recommended for each hour of class.

The required textbook for the course:
Probability and Statistics for Engineers and Scientists, 9th Edition, by Walpole, Myers, Myers, & Ye. Pearson, ISBN: 978-0-13-411585-6.

Course Information and Grading
Zoom class participation and in-class quizzes accumulate points towards your final grade. Quiz problems (7 quizzes in total) will be based on homework. Homework will be assigned but not collected. There will also be five worksheets that will be assigned, collected, and graded.
Your letter grade will be based on the better one of the following two averages:
Formula 1:
45% 9 better scores out of the 12 worksheets and quizzes. **There will be no make up quizzes. Quiz dates are announced in advance.**

36% 2 exams given during the course of the semester before the Final Exam
19% Final Exam

Formula 2:

36% 9 better scores out of the 12 worksheets and quizzes. **There will be no make up quizzes. Quiz dates are announced in advance.**
40% 2 exams given during the course of the semester before the Final Exam
24% Final Exam

Conversion of Course Average to Course Grade

Course	*Course Grade*
90-100	A
87-89	A-
84-86	B+
80-83	B
77-79	B-
74-76	C+
70-73	C
67-69	C-
64-66	D+
55-63	D
below 55	F

Fall 2020 Exam Dates:

Exam 1: October 5, 2020

Exam 2: November 11, 2020

Final: TBA

Policies for Exams, Quizzes, and Homework:

If you have missed, or will need to miss an exam and want a make-up, please refer to the full make-up exam policy online:
https://math.nyu.edu/tandon/policy.html
It is University policy that an out-of-sequence exam can be administered only if there is prior authorization by the Mathematics Department or the Office of Student Affairs. If you miss an exam for a medical, religious, or family emergency reason, you must provide written documentation to the Math Department at soe.math@nyu.edu in order to schedule a make-up exam within 2 days of the missed exam, or upon your first day returning to class if the documentation excuses a longer absence. Make-ups will not be granted to students who

do not notify the Math Department in a timely manner. Students may be asked to seek additional approval from the Office of Student Affairs.
We cannot accommodate out-of-sequence exams, quizzes, and finals for reasons of convenient travel, even if you have already purchased tickets. Please note carefully the date of your exams and final and plan your travel schedule accordingly.
We will not give makeup quiz for any reason. (You can drop 3 quiz/worksheet grades without hurting your grades.)

NYU School of Engineering Policies and Procedures on Academic Misconduct:
Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated.

Furthermore, those who
A. breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.
B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:
1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

For Information on Tutoring, Workshop and Extra Help Visit:
http://math.engineering.nyu.edu/courses/help_center.phtml

Moses Center Statement of Disability:
If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.

You may only use a TI-30 calculator during the exams. (Allowed: TI-30Xa, TI-30X IIS or IIB, TI-30 Multiview XS or XB. Not allowed: TI-30X Pro, TI-36X Pro MultiView.)

Class Etiquette: Please do not eat or drink, talk or text on your cell phone in class.

Lecture Schedule MA2224 Fall 2020

Lecture 1:
- 2.1: Sample Space
- 2.2: Events
- 2.3 Counting Sample Points
- 2.4: Probability of an Event

Lecture 2:
- 2.5: Additive Rules
- 2.6: Conditional Probability, Independence, and Product Rule

Lecture 3:
- 2.7: Bayes' Rule
- 3.1: Concept of a Random Variable
- 3.2: Discrete Probability Distributions

Lecture 4: Quiz 1 (Chapter 2)
- 3.3: Continuous Probability Distributions
- 3.4 Joint Probability Distribution (Discrete Case)

Lecture 5:
- 4.1: Mean of a Random Variable
- 4.2: Variance of a Random Variable

Lecture 6
- 4.3: Means and Variances of Linear-Combinations of random variables
- 5.2: Binomial and Multinomial Distributions
- 5.3: Hypergeometric Distributions

Lecture 7: Quiz 2 (Chapters 3 & 4)
- 5.4: Negative Binomial and Geometric Distributions
- 5.5: Poisson Distributions and the Poisson Process
- 6.1: Continuous Uniform Distribution

Lecture 8

- 6.2: Normal Distribution
- 6.3: Areas under the Normal Curve
- **Catch Up and Review for Midterm 1: Covers Chapters 2-5**

Lecture 9: Midterm 1

Lecture 10:

- 6.4 Applications of the Normal Distribution
- 6.6: Gamma and Exponential Distributions

Lecture 11

- 6.7: Chi-Squared Distribution
- 6.9 Lognormal Distribution
- 7.3: Moments and Moment-Generating Functions

Lecture 12 Quiz 3 (Chapter 6)

- Chapter 1: Introduction to Statistics and Data Analysis
- 8.1: Random Sampling
- 8.2: Some Important Statistics
- 8.3: Sampling Distributions
- 8.4: Sampling Distribution of Means and the central Limit Theorem

Lecture 13

- 6.5 Normal Approximation to the Binomial
- 8.5: Sampling Distribution of Sample Variance S^2

Lecture 14:

- 8.6: t-Distribution
- 8.7: F-Distribution
- 9.2 Statistical Inference
- 9.3 Classical Methods of Estimation

Lecture 15: Quiz 4 (Sections 6.5, 7.3 & Chapter 8)

- 9.4 Single Sample: Estimating the Mean
- 9.5 Standard Error of a Point Estimate

Lecture 16:

- 9.6: Prediction Intervals
- 9.8: Two Samples: Estimating the Difference between Two Means
- 9.9: Paired Observations

Lecture 17:

- 9.10: Single Sample: Estimating a Proportion
- 9.11: Two Samples: Estimating the Difference between Two Proportion

Lecture 18: Quiz 5 (Sections 9.1-9.9)

- 9.12 & 9.13: One- and Two-Sample: Estimating the Variance(s)
- 10.1: Statistical Hypothesis: General Concepts
- 10.2: Testing of a statistical Hypothesis

Lecture 19: Catch Up and Review for Midterm 2: Covers Chapters 6.6-chapter 9
Lecture 20, Midterm 2

Lecture 21:

- 10.3: The Use of P-values
- 10.4 Single Sample: Tests concerning a Single Mean

Lecture 22:

- 10.5: Two Samples: Tests on Two Means
- 10.6: Choice of Sample Size for Testing Means

Lecture 23: Quiz 6 (Sections 10.1-10.4)

- 10.8 & 10.9: One- and Two-Sample Tests Concerning Proportions
- 10.10: One- and Two-Sample Tests Concerning Variances

Lecture 24:

- 10.11: Goodness of Fit Test
- 10.12: Tests for Independence
- 10.13: Tests for Homogeneity

Lecture 25:

- 11.2: The Simple Linear Regression Model
- 11.3: Least Squares and the Fitted Model
- 11.4: Properties of the Least Squares Estimators

Lecture 26: Quiz 7 (Sections 10.5-10.13)

- 11.5: Inferences Concerning the Regression Coefficients
- 11.6: Prediction
- 11.7: Choice of a Regression Model

Lecture 27:

- 13.1: Analysis of Variance Technique
- 13.2: The Strategy of Experimental Design
- 13.3: One-Way ANOVA
- 11.8 Analysis-of-Variance Approach

Lecture 28 Review for Final Exam, covers mostly sections after exam 2.
The final exam will be scheduled during the finals week.