MATH 205, Section 2

Probability and Statistics

Spring 2021, Session 4

昆山杜克大学
DUKE KUNSHAN UNIVERSITY

Dates / Synchronous meeting time	:	MoTuWeTh **14:45—16:00 IB 1047**
Recitation	:	Thursdays **20:10–21:10 AB 1079**
Academic credit	:	4
(Hybrid) Course Format	:	Lectures, Recitation (and Recordings)
All Zoom Meetings Passcode	:	205212

Instructor

Dr. Lin Jiu	Lecturer of Mathematics, Duke Kunshan University Assistant Professor of the Practice, Duke University
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Office Hours	Tuesdays: 20:00–21:00, Zoom 937 2658 7043 (Passcode 205212) & In office Wednesday: 9:30–11:30, in office or by appointment

Teaching Assistant

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Office Hours	Fridays, 9:00--10:00 AB 2118

Grading Policy

- Homework: 24% (4%×6)
- Quiz: 10% (2%×5)
- Midterm: 15% each (30% total)
- Final Exam: 36%

A+= 98% - 100% A = 93% - 97.99%; A- = 90% - 92.99%; B+ = 87% - 89.99%; B = 83% - 86.99%; B- = 80% - 82.99%; C+ = 77% - 79.99%; C = 73% - 76.99%; C- = 70% - 72.99%; D+ = 67% - 69.99%; D = 63% - 66.99%; D- = 60% - 62.99% F = 59.99% and below
As you can see, the final percentage will be rounded DOWN to the closest integer.

Homework

Weekly homework will be assigned each Thursday and will be due on the following Thursday's lecture, except for the last week. **No late homework will be accepted**. Each homework will be counted 4%.

Quiz

Except for two midterms on the 3rd and 6th weeks, there will be a quiz during Thursday's recitation time, with 2% each, for the rest five weeks.

Midterm and Final Exams

Two midterms will be given in the **third** and **sixth** week, during recitation time slots, i.e., Thursday 20:10–21:10.

For all the exams, they will be an in-class test for students on campus and remote students will take them synchronously, unless your time zone does not allow.

In case of documented illness or family emergency or documented University sponsored trips, you may miss the midterm, but the supporting documentation must be submitted to the instructor in advance. With the document, your missing midterm score can be counted as the same as your final. Do remember: let me know BEFORE the exam. An unexcused absence from any exam will be counted as a zero.

Remark. If you have concerns about your tests, you have two options:

- re-calculating the grade, if you find the final grade does not match the sum of all the problems;
- re-grading, which only applies to the whole test instead of each problem. That is, you can ask me to regrade your test, but NOT a single problem.

What background knowledge do I need before taking this course?

Prerequisite: MATH101/105

References for this Course (All books are suggested)

1. "Calculus, Volume II", by OpenSTAX.
   Find it HERE
2. "Probability and Statistics The Science of Uncertainty Second Edition" by Michael J. Evans and Jeffrey S. Rosenthal
   Find it HERE
3. "Introductory Statistics", by OpenSTAX.
   Find it HERE

Course Outline

We will cover most of the following materials from the textbooks (Tentatively, may up to some perturbation).

Week 1	**Topic**: Sequences (definition, convergent sequences, find the limit of a convergent sequence, properties of convergent sequences), series (partial sums, convergent series, geometric series, harmonic series, test for divergence).
Week 2	**Topic**: Testing series, power series, Taylor series, general series of functions
Week 3	**Topic**: Probability models and axioms, conditional probability, Bayes' theorem, independence, counting, discrete random variables, p.m.f. Midterm I: Covers **Sequences and Series**
Week 4	**Topic**: Joint p.m.f., conditional probability, independence, continuous random variables, expectation and variance
Week 5	**Topic**: Bivariate continuous random variables, joint density, marginals, independence, covariance, correlation, sum of independent random variables, weak law of large numbers
Week 6	**Topic**: Central limit theorem and applications, point estimation, maximum likelihood estimator, large and small sample confidence interval, hypothesis testing Midterm II: Covers **Probability part**
Week 7	**Topic**: Contingency table, goodness of fit, linear regression

Final Exam: May 10th, 19:00–22:00, AB 1087

What is this course about?

This course serves as an introduction to probability theory and statistics, with emphasis on problem solving. These topics have long been essential to the development of scientific theories and the interpretation of experimental results. With the advent of modern tools for collecting massive amounts of data, statistical modeling and analysis has become essential for scientific progress with applications across the natural and social sciences. Probability theory is an integral part of the modern physics worldview, lying at the core of quantum mechanics and playing an essential role in explaining the properties of large collections of particles. It also forms the basis for theories of statistical inference from data of all sorts. This course provides a mathematical foundation essential for natural scientists and social scientists alike.

The first part of the course covers sequences and series, expanding on what was covered in calculus. The second part of the course covers basic concepts of probability and statistics.

Objectives

There are two main objectives for this course. Naturally one goal is that students learn

(i) the fundamental concepts of sequences, series, probability and some of its applications to statistics,

(ii) and to develop a range of skills which will allow them to apply the concepts effectively.

A second and equally important goal is for students to learn to think in a precise and rigorous manner and to develop the ability to approach questions analytically.

Some of the skills include:

- An understanding of the concept of convergence of sequences and series of real numbers;
- An understanding of the definition of independent, identically distributed variables;
- Compute probabilities associated with a discrete probability distribution;
- Compute probabilities associated with a continuous probability distribution;
- Compute the probability of occurrence of a set of independent events;
- Become familiar with binomial, Poisson, and normal distributions;
- An understanding of Bayes' theorem;
- An understanding of the meaning of confidence intervals, statistical and systematic errors, and applications;
- An understanding of Chi-squared-tests, T-tests, and relevant applications;
- An understanding of the concept of linear regression and how to apply it to analyzing data;
- Problem solving.

Academic Integrity:

This is very important!

Any misconduct behavior on homework, including but not limited to copying another student's homework paper, copying a solution found in another book or notes or website will, at minimum, result in a zero on that assignment and may result in a failing grade for the course. The incident will be reported to the Dean of Undergraduate Studies. The penalty on misconduct behavior on exam will be much more severe.

Academic Policy & Procedures:

You are responsible for knowing and adhering to academic policy and procedures as published in University Bulletin and Student Handbook. Please note, an incident of behavioral infraction or academic dishonesty (cheating on a test, plagiarizing, etc.) will result in immediate action from me, in consultation with university administration (e.g., Dean of Undergraduate Studies, Student Conduct, Academic Advising). Please visit the Undergraduate Studies website for additional guidance related to academic policy and procedures. Academic integrity is everyone's responsibility.

Academic Disruptive Behavior and Community Standard:

Please avoid all forms of disruptive behavior, including but not limited to: verbal or physical threats, repeated obscenities, unreasonable interference with class discussion, making/receiving personal phone calls, text messages or pages during class, excessive tardiness, leaving and entering class frequently without notice of illness or other extenuating circumstances, and persisting in disruptive personal conversations with other class members. Please turn off phones, pagers, etc. during class unless instructed otherwise if you choose not to adhere to these standards, I will take action in consultation with university administration (e.g., Dean of Undergraduate Studies, Student Conduct, Academic Advising).

Academic Accommodations:

If you need to request accommodation for a disability, you need a signed accommodation plan from Campus Health Services, and you need to provide a copy of that plan to me. Visit the Office of Student Affairs website for additional information and instruction related to accommodations.